ENGINEERING AND MINING JOURNAL

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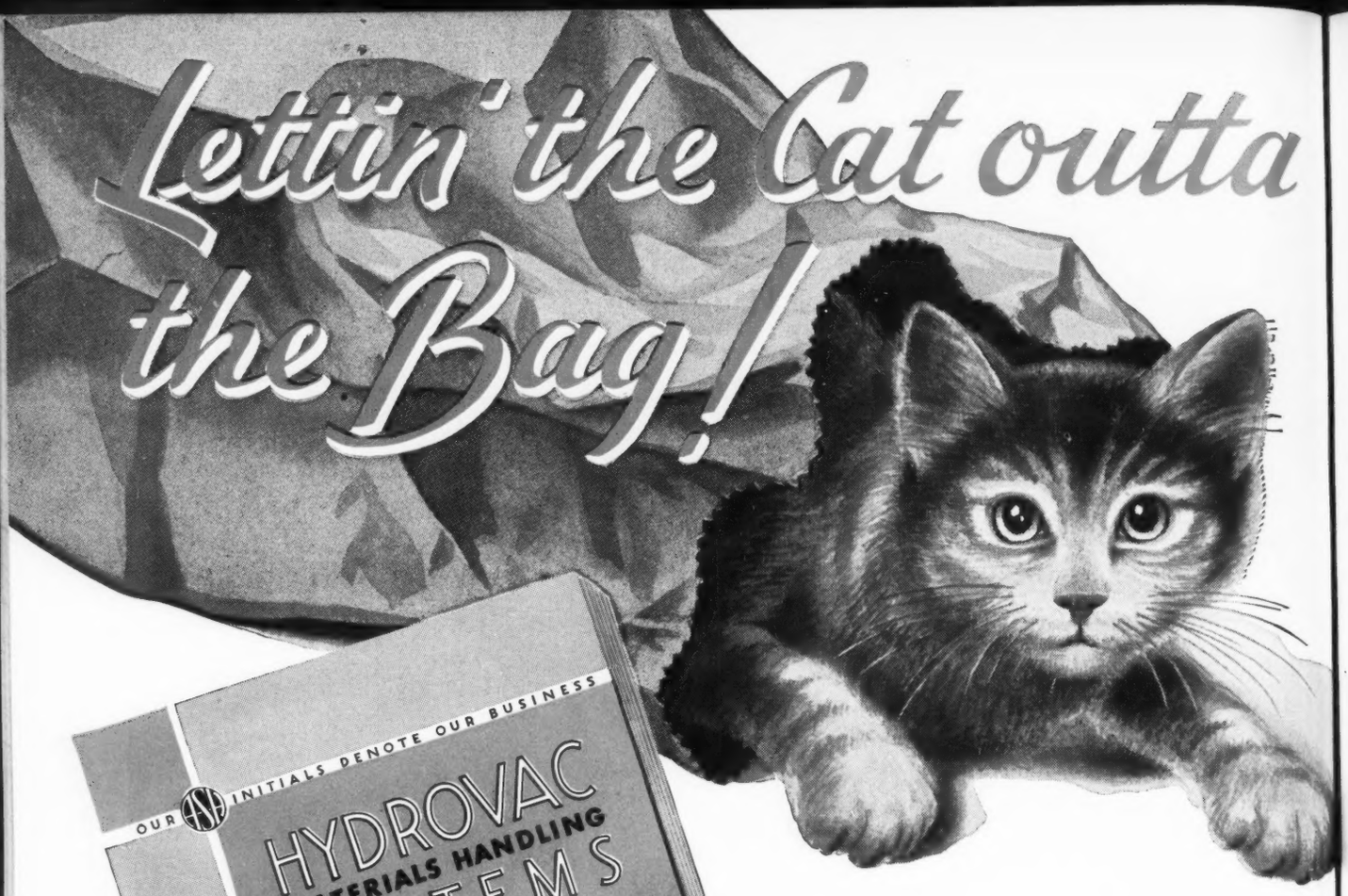
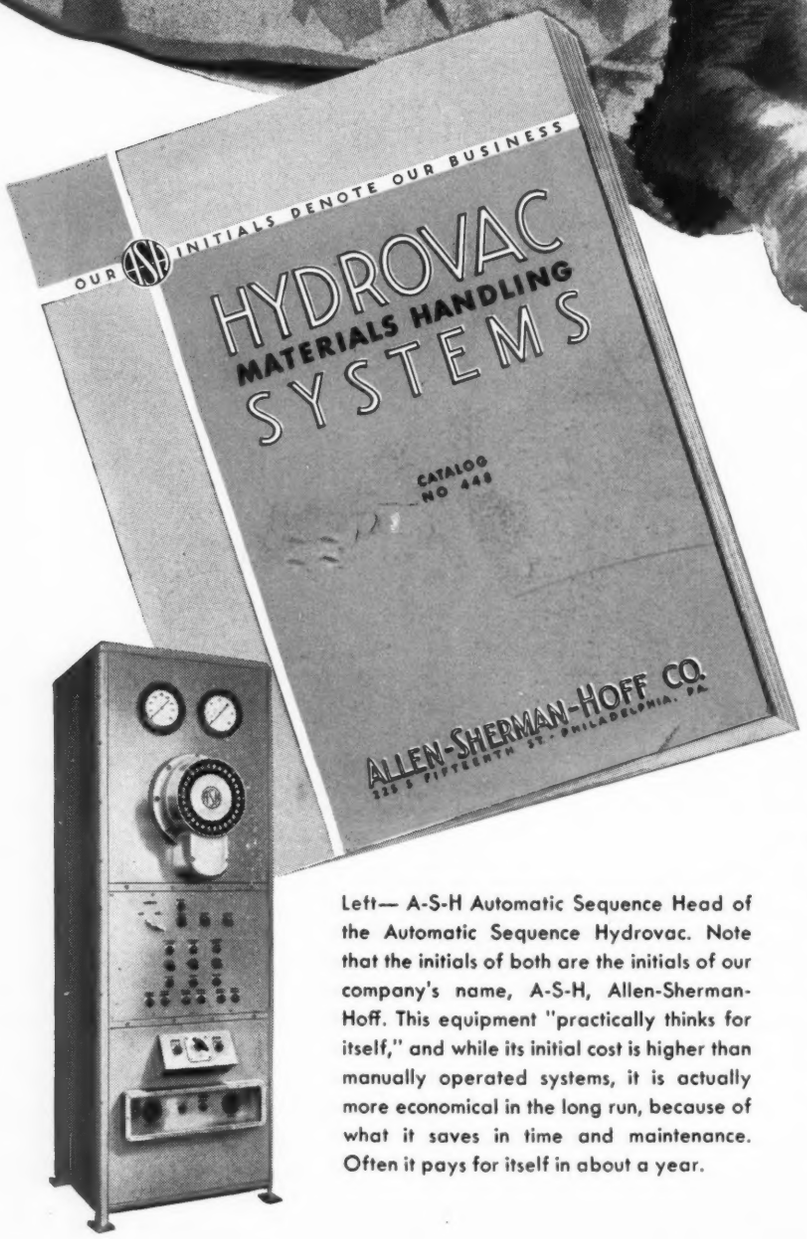
JUNE, 1948

Operating the Boskovich shaft mucker, Mayflower Shaft, New Park Mine, Utah—Page 33

Noralyn Phosphate Plant—World's Biggest—Page 70

Lettin' the Cat outta the Bag!





Left— A-S-H Automatic Sequence Head of the Automatic Sequence Hydrovac. Note that the initials of both are the initials of our company's name, A-S-H, Allen-Sherman-Hoff. This equipment "practically thinks for itself," and while its initial cost is higher than manually operated systems, it is actually more economical in the long run, because of what it saves in time and maintenance. Often it pays for itself in about a year.

It took five long years of designing, experimenting and building to perfect the new Automatic Sequence Remote Control Hydrovac System for handling anything from the finest dust up to loose, bulk granular materials of various sizes. To the men and companies contributing to this development, quite aptly referred to as the "Pneumatic Materials Handling System of Tomorrow," we express our heartfelt thanks. . . . We are "Lettin' the Cat Outta the Bag" with the publishing of a new catalog, covering manual and automatic systems for handling material in metal and non-metallic mines, coal burning generating and heating plants, process industries, etc. . . . A letter from you will bring one of the catalogs very promptly. If your problem is urgent, tell us in the letter that you want an engineer to bring the catalog and discuss your particular job with you.

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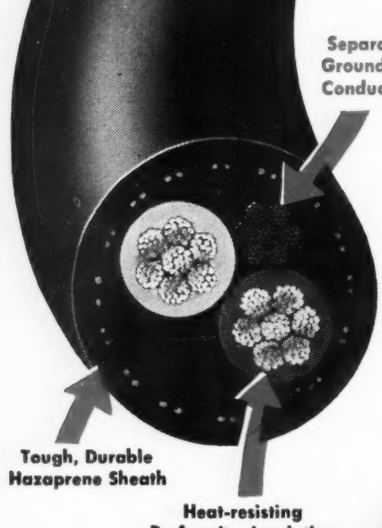

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ENGINEERING AND MINING JOURNAL

JUNE, 1948

Private Development Of Uranium Is Encouraged

CONTRARY TO a widely held belief, the Atomic Energy Commission is anxious to stimulate private production of uranium ores and concentrates. To this end, the commission plans to aid prospectors and owners with geological advice and drilling, to guarantee prices, and to reward new discoveries.

Technically, the commission does have power to step in and take over uranium-bearing deposits, presumably upon payment of compensation to the owners. However, the present policy is to leave properties in private hands, and to encourage private production.

The AEC will carry on geological investigations, drilling and development on both public and private lands for the purpose of furthering discoveries. It also offers a bonus of $10,000 for the delivery of the first 20 tons of uranium ore or mechanically produced concentrates (exclusive of carnotite or roscoelite ores) from any single lode or placer location. For practical purposes this means discovery of a good uraninite or pitchblende deposit, as no single pegmatite claim is likely to produce 20 tons of uranium concentrate. Development of carnotite-roscoelite ores is encouraged by an improved price schedule and financial assistance in development. An attractive price schedule is offered on a ten-year guaranteed basis for high grade ores and concentrates, and on a three-year basis for carnotite-roscoelite ores of the Colorado Plateau (E&MJ, May, p. 108, and this issue, p. 103). Also, the Interior Department has ruled that despite the reservation of uranium deposits on public lands, private claims are valid if they are valuable for other minerals as well as uranium. As for claims that prove to be valuable for uranium only, the AEC has stated that, upon notice, it "will take steps to protect the prospector's equity."

All these considerations clearly suggest that private individuals or groups who would like to prospect should not avoid consideration of uranium deposits simply because the Government has the right to confiscate such properties. The inducements to discover and produce are substantial, and, even if a property should be confiscated, there will no doubt be appropriate compensation to the private owners.

Basing-Point Decisions Deserve Serious Study

BECAUSE BASING-POINT selling is common practice in marketing some important metals – and thus affects concentrate settlements as well – it behooves the entire metal mining industry to keep informed as to the implications of recent court decisions affecting basing-point sales (E&MJ, May, p. 106).

Briefly, in deciding against the cement industry, the Supreme Court has confirmed the position of the Federal Trade Commission in outlawing the collusive maintenance of a pricing system under which all sellers quote identical prices for delivery to the same destination. The court found that collusive support of such a system is "unfair competition" under the Federal Trade Commission Act and unlawful price discrimination under the Clayton Act.

As highlighted in Justice Burton's dissent, the decision leaves many points of general interest unanswered. The court and the commission found the cement producers guilty of *acting in concert* to effectuate their basing point pricing system. Justice Burton points out that the decision therefore leaves undecided the status of a producer who acts individually to absorb freight charges. Also, the lower court had asserted that the element of combination was essential to guilt and, finding evidence of combination insufficient, held the defendants not guilty. The Supreme Court sustained the commission's finding as to a combination; thus in holding the defendants guilty, it left undecided what the status of the producers would have been had there been no combination.

However, this point was decided in a subsequent decision of the Seventh Circuit Court of Appeals in mid-May. In finding against the steel conduit manufacturers, the court decided that evidence of combination or conspiracy was unnecessary, as "Such an agreement may be shown by circumstantial evidence."

The producer who wants to make a common-sense interpretation of the situation and stay out of trouble without resorting to legalistic hair splitting can be guided by two obvious facts. First, the Supreme Court

is sympathetic to the aims and policies of the commission, and is inclined to give the commission considerable leeway in administering its legislative mandates. Second, the commission is bent on outlawing pricing systems which result in continuously identical prices for the same commodities from different sellers delivered to a given destination. The commission frowns on both phantom freight and freight absorption, preferring a pricing system giving the same net returns at the seller's plant on all shipments, with due allowances for quantity, grade or other features reflecting production or handling costs. It would sanction discrimination in favor of a given customer only in specific instances where a price reduction is made to meet competition. Thus the commission seems to be inviting a marketing system that will be featured by endless haggling, unstable prices, and limited competition between sellers that favors the large producers having a number of plants.

Unless Congress steps in with legislative modifications, obviously the metal industries, and possibly all industries operating on a delivered-price basis, are going to be profoundly affected, and upset. The future effect on competition and prices is difficult to estimate, partly because freight rate determinations frequently take competition into account, and partly because nobody can predict the extent to which special pricing on individual sales will affect the markets.

Aluminum Faces Competition for Power

THE STORY OF ALUMINUM production in recent years is one of the most interesting and surprising commodity histories of all time. Peak production of this metal before the war was 143,441 tons per year, which put it clearly into a secondary class compared to copper, lead and zinc. Everyone knows of the meteoric rise of aluminum production during the war and that, by dint of a miraculous expansion of capacity, the fantastic goals of airplane production were attained. However, few remember that this achievement was possible because Alcoa stepped out and expanded its capacity while our military planners were still in doubt that such expansion was necessary.

During the war, aluminum production reached a peak of 920,179 tons per year, which put the metal tonnagewise ahead of lead and volumewise at the head of the non-ferrous list. Considering the enormous wartime growth and the fact that so much production went into military equipment that would probably be salvaged after the war, everyone naturally expected the postwar history of aluminum to be a headache to the primary producers, as was the case in copper after the First World War.

Again, however, aluminum foiled its prophets. Despite a very active rate of airplane salvage, consumption of primary aluminum held surprisingly high after the war, the low point being 409,30 tons in 1946. This unexpected good experience was supported in part by the shortages of steel and non-ferrous metals.

The low level of demand was very brief and ever since the spring of 1947 calls for aluminum have been increasing, even to the extent of creating a shortage. Now that there are definite plans for an expanded air force, this shortage may well become acute enough to provoke allocation by Government to the more essential users, as is also threatened for copper and lead. The present plant capacity is considered to be about 650,000 tons per year, but effective capacity is somewhat lower for lack of power.

Because it takes 10-12 kwh. per lb. to reduce aluminum, a low price for the metal is tied to the availability of low cost electric power. At one or two-mill rates, power is a minor element in the price of aluminum. However, in the light of current construction, fuel and labor costs nobody is thinking of new power developments at less than five mills for hydro and eight mills for steam power. Such power costs add up to an element in the cost of light-metal production that cannot be brushed aside.

When the Government undertook its grandiose program of power development on the Columbia River and tributaries, most people who considered themselves competent to pass judgment thought it might take several decades before demand for power would overtake supply in this sparsely settled area. Here again the prophets were wrong. The wartime needs for metal caused the construction of substantial light-metal capacity in the Northwest and the growth of other war-stimulated industry in the area created a considerable additional power market. The attractiveness of the region as a place to live and its resources have led to continued population and industrial growth, with the result that aluminum production in the area finds itself confronted with important competition for power. This competition presents difficulty not only pricewise, but because of the great desire of local people to foster industrial diversification.

The Northwest still has great undeveloped power potentialities. However, these will take years to harness and nobody can predict how rapidly continued industrial and population growth will create competition for such power. Meanwhile, it is reported that the aluminum producers are considering Texas, with its abundant gas supply and accessibility to South American and Caribbean bauxite, as an appropriate location for new capacity (E&MJ, May, p. 106). However, other industries are also looking toward the gas of the Southwest, including manufacturers of synthetic gasoline and added pipeline outlets. Thus, there are at least some grounds for wonder if requirements for aluminum can be met in the future without a price increase to assure the producers of their power needs.

National Mineral Tax Policy

BY DR. DONALD H. McLAUGHLIN

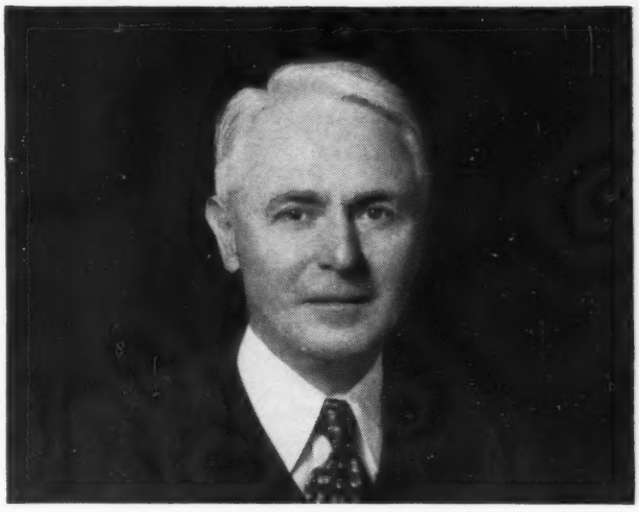
President, Homestake Mining Co., and chairman, Interior Department Minerals Advisory Committee.

IN OBTAINING the Nation's mineral requirements, our first principle as a government should be the preservation of conditions that permit free competitive enterprise to function. The best and most effective incentive that our Government can provide is the opportunity under our laws and customs to win a profit through bold, intelligent and skillful operations, on the part of those who are willing to take risks and to do their utmost to win success with all means that modern science and technology provide. The hope of profit has led and will continue to lead Americans, as individuals and in corporate groups, to undertake new ventures and to endeavor with skill and ingenuity to accomplish their objectives economically and efficiently. Of all the incentives that a government of the sort to which we are devoted might provide, the maintenance of laws and conditions that permit truly free enterprise is surely the most effective in exploration for new deposits and in development of adequate reserves of minerals and fuels as well as maintaining a healthy and active mining industry.

Proposals as to specific incentives on the part of the Government should be most carefully reviewed not only for the benefits that might be derived from them but also for the dangers that they might create by establishing controls over operations that would stifle free enterprise by destroying independence and initiative. In the extreme such a policy might lead to direct operations by official agencies with all their deadening effects.

In my judgment, by far the most desirable aid that could be given to the mining industry, and probably the only one that is needed except possibly in times of great emergency, is tax reform. It could be accomplished without violation of the basic principles of the income tax, merely by proper recognition of the essential characteristics of mining enterprises, without claiming special consideration not properly due them.

At present, the maximum return that the individual or corporate group can obtain from a successful mining venture *after taxes* is so small that there is no incentive to spend money in such a hazardous venture as mineral exploration. Why take risks, if, when one wins, the major part of the returns must go to another party who has ventured nothing? With the unrealistic treatment by the Treasury of costs of exploration and development, and with the initially inadequate allowance for depletion reduced by a succession of extreme and arbitrary restrictions, there is little if any hope these days of a sufficient return even from a successful mining undertaking to warrant the persistent expenditures that must be made on a long succession of prospects before the valuable deposit is finally located and a productive mine created. No changes in theory of taxation and no special privileges are needed to correct these inequities. Merely spelling out certain principles of taxation of income in such simple language that they could not be modified by bureaucratic interpretation would be enough.



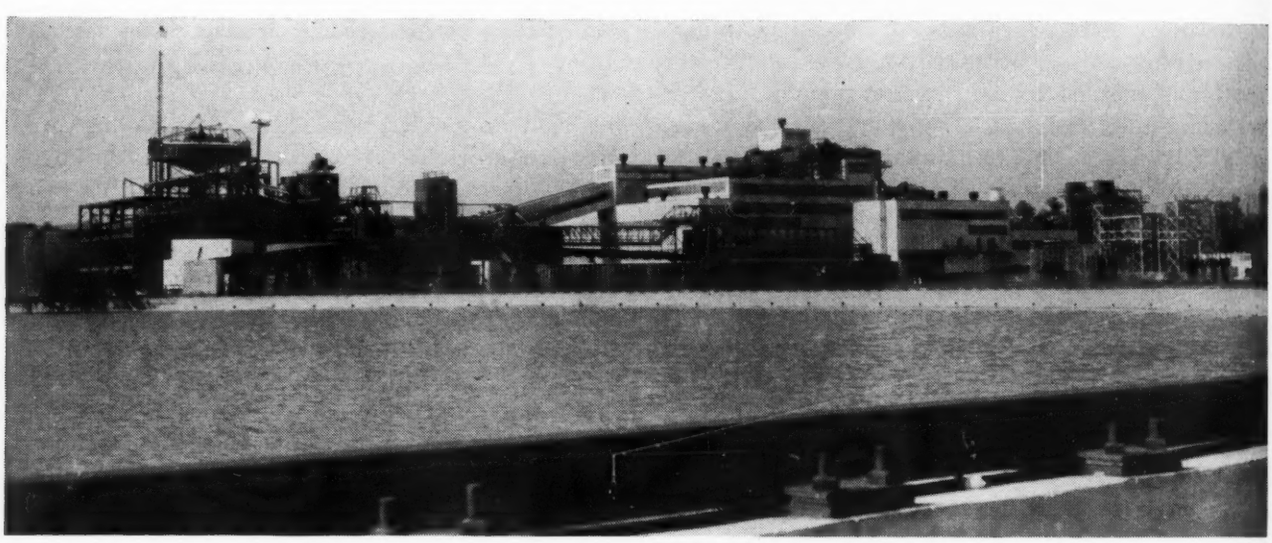
DR. DONALD H. McLAUGHLIN

Furthermore, when it is recalled that the income from a mine operated by a corporation is again subject to taxation when paid to the stockholders or the owners in dividends, ultimate profits are reduced to a level that restoration of capital within the life of the orebodies and a fair return are virtually impossible. So why put money in mining? The answer is clear. It isn't being provided by individuals or corporations under present taxes in sufficient quantity to carry on exploration at the rate necessary to keep the nation's proved reserves at a proper figure.

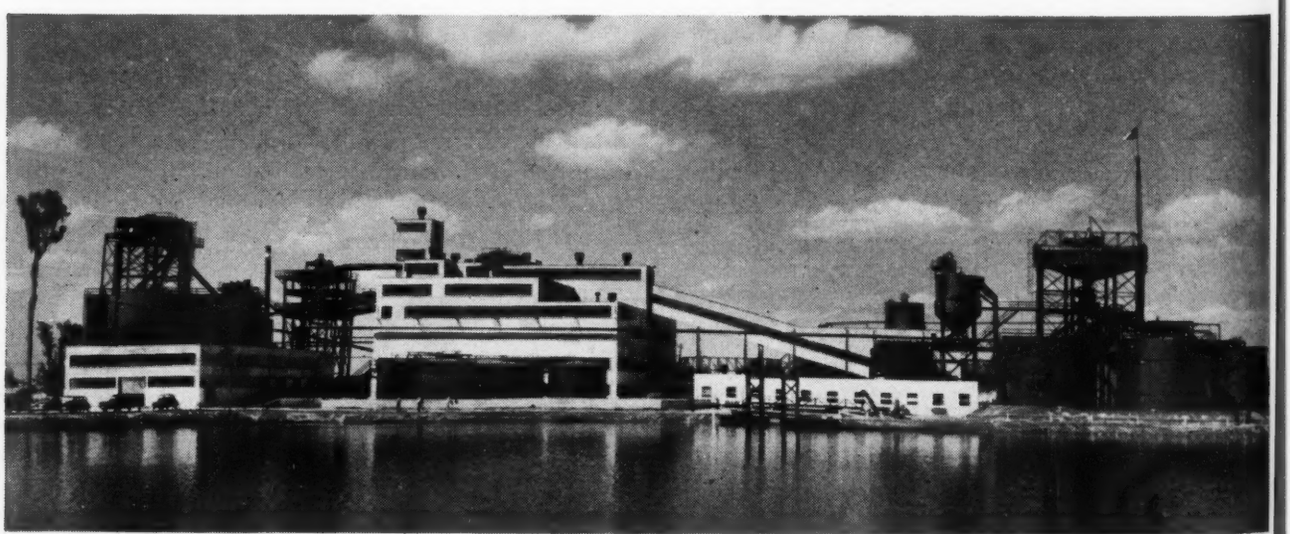
As I have stated, correction of the inequities mentioned above could be made simply on general principles with no request for special consideration due to unusual hazards or national policy. If, however, further incentives are needed to encourage exploration and to maintain operations of marginal mines, special provisions for tax relief would afford a less cumbersome means than collecting the money in taxes from the industry and others and paying it back to a selected group of operators. Specific incentives that might be provided through changes in the tax laws would be relief from all payments until the entire cost of exploration (including money spent on failures in the campaign leading to the promising find), and the entire cost of development and plant had been returned. A substantially increased depletion allowance for the entire metal mining industry might also be urged with good logic to allow the mining adventurer better opportunity to recover his losses and to retain a proper return from his occasional successful enterprise.

International Minerals & Chemical Corp.'s newest phosphate plant

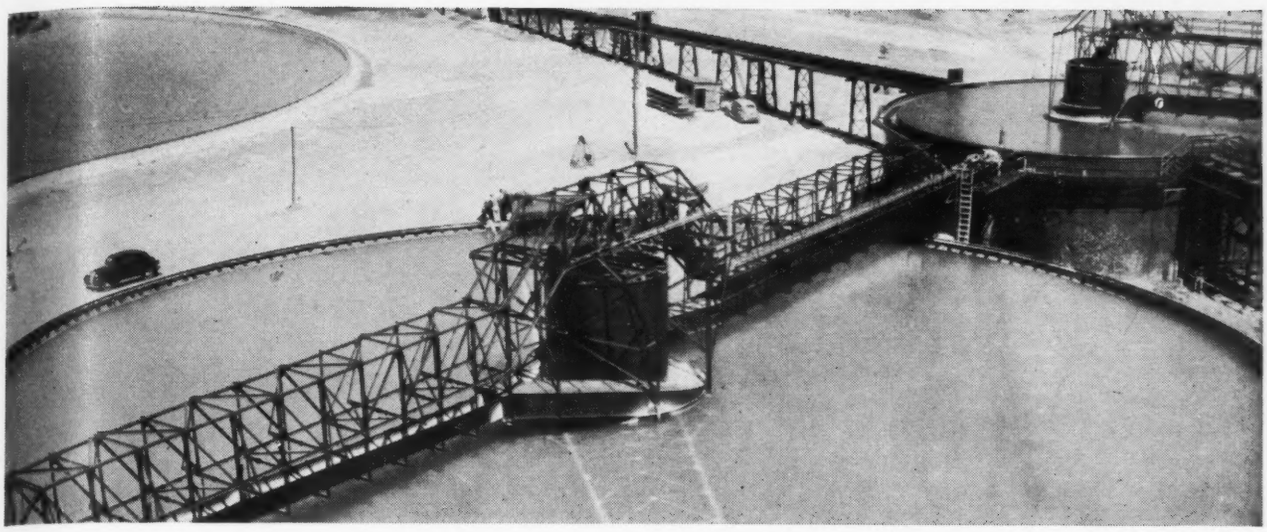
1 THE NORALYN PLANT presents a striking scene at night. This picture and photo No. 2 were taken from the same point.



2 IN THIS VIEW OF THE PLANT, looking across 175-ft. hydroseparator, the washer and substation are seen at right. Flotation building, housing cells and spirals, is to left and behind it. Sizing section and flotation-feed tanks are at left of picture.



3 PLANT FROM OPPOSITE SIDE, looking across reservoir. Right to left are: flotation-feed tanks and 50-ft. hydroseparator; surge tanks for flotation cells and spirals; pump house (low white building); conveyor gallery to flotation building; in front of latter the reagent tanks; dewatering hydro for amine feed; concentrate bins and dewatering classifier. In front, warehouse, shops, and boiler house.

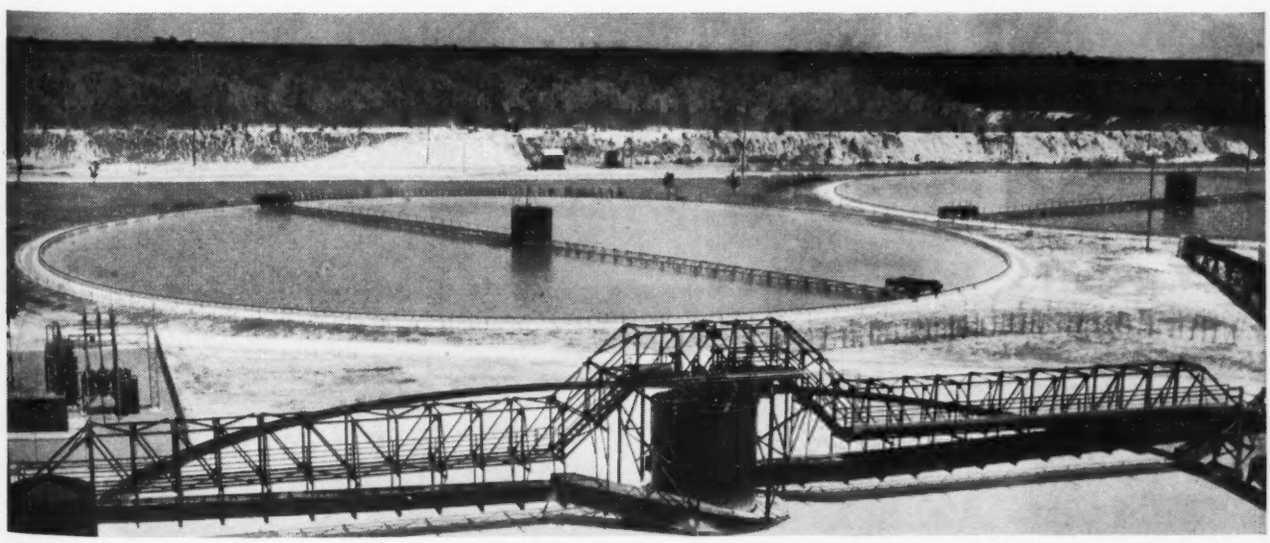


4 HYDROSEPARATOR 175 ft. in diameter, in foreground, receives the phosphate debris from the washer, also the overflow from 85-ft. hydroseparator in upper right and the underflow from the two 383-ft. thickeners, one of which is seen in upper left. The big hydro has a double set of rakes, the additional set being inside the main set and turning at twice the speed.

Noralyn Phosphate Plant World's Biggest

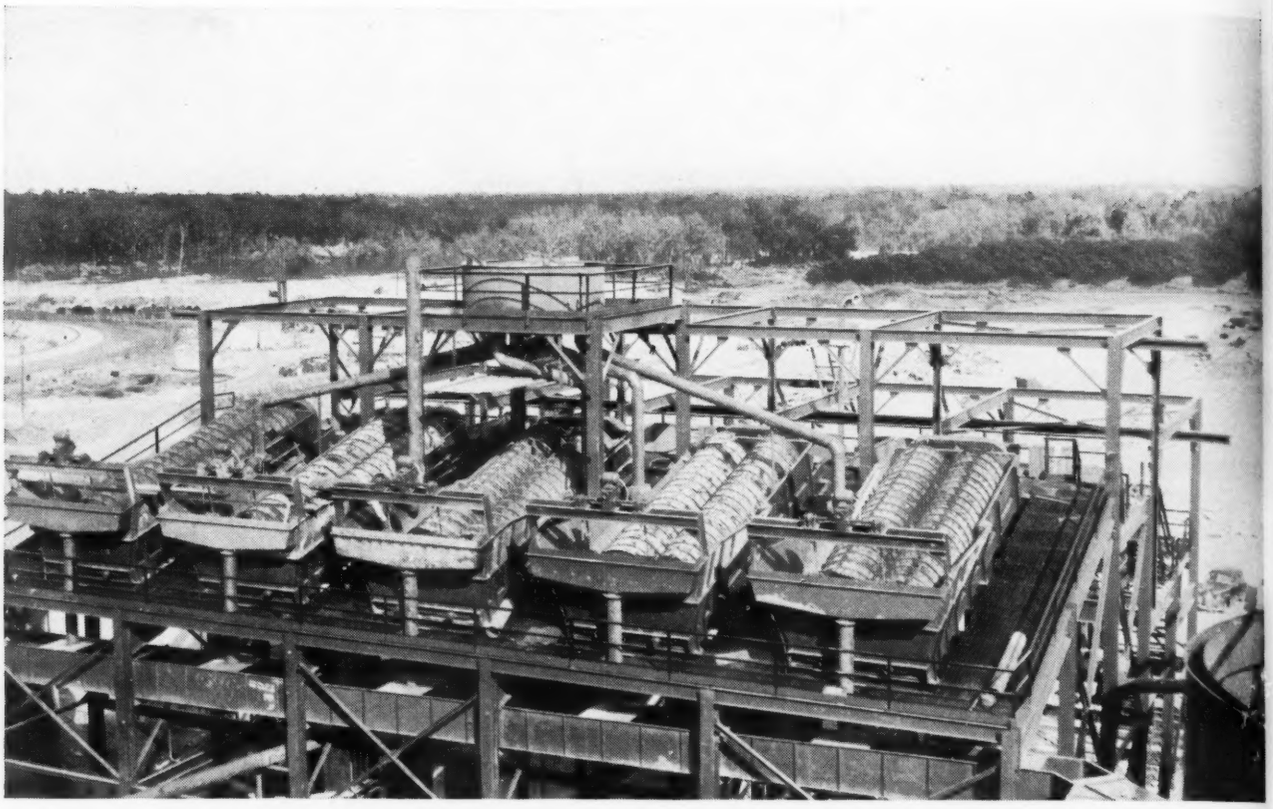
Centralized remote control is only one of the outstanding features of International Minerals & Chemical Corporation's new concentrator in Florida. Its substantial construction matches the long prospective life of the mine it serves

ANTICIPATION OF FUTURE NEEDS of phosphate rock and the necessity of meeting the current big and growing demand for that important fertilizer material at home and abroad led to the conception of building the new Noralyn phosphate washer and concentrator of International Minerals & Chemical Corporation,

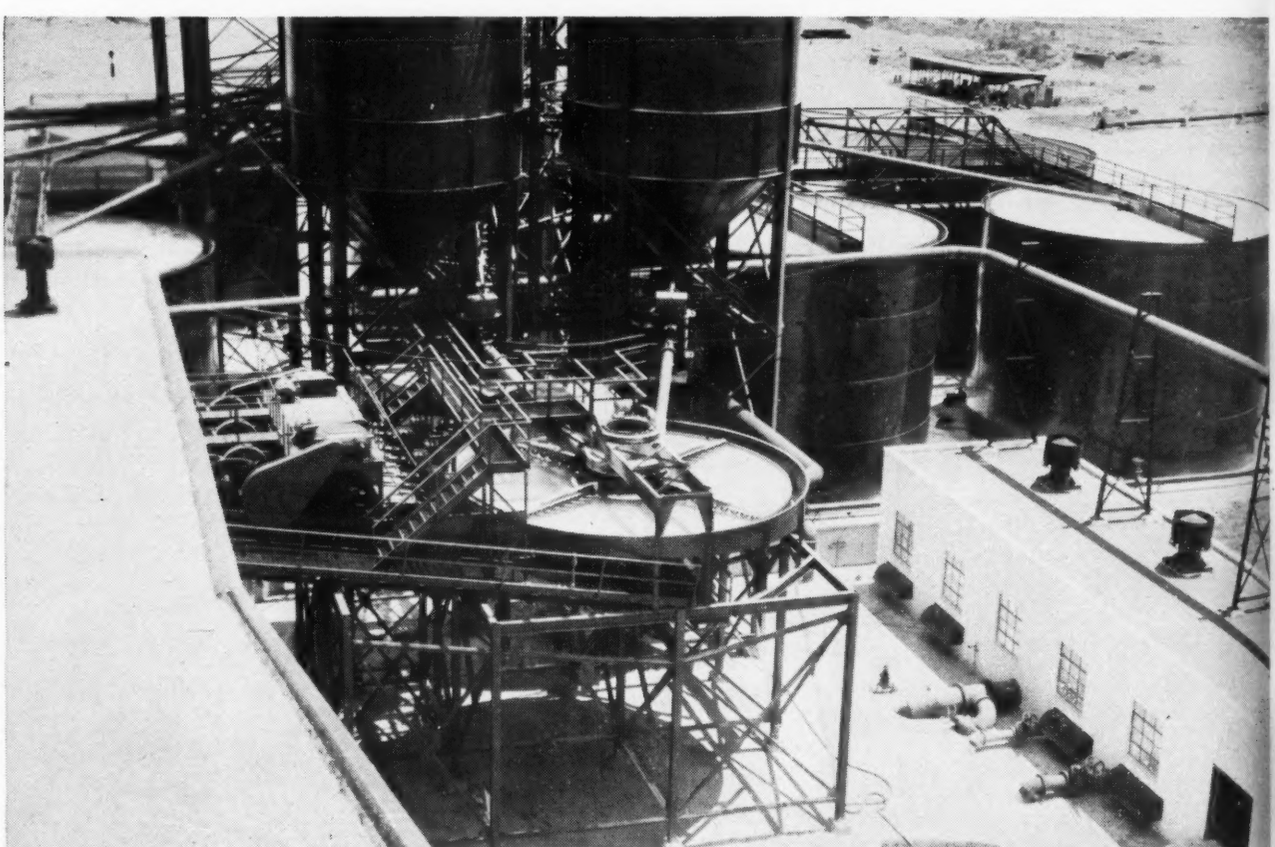


5 THE TWO THICKENERS, each of which is 383 ft. in diameter (seen looking across 175-ft. hydroseparator), serve to clarify the various overflows sent to them from various points in the plant. The clarified water is sent to storage. Thickener underflow is delivered to the 175-ft. hydroseparator.

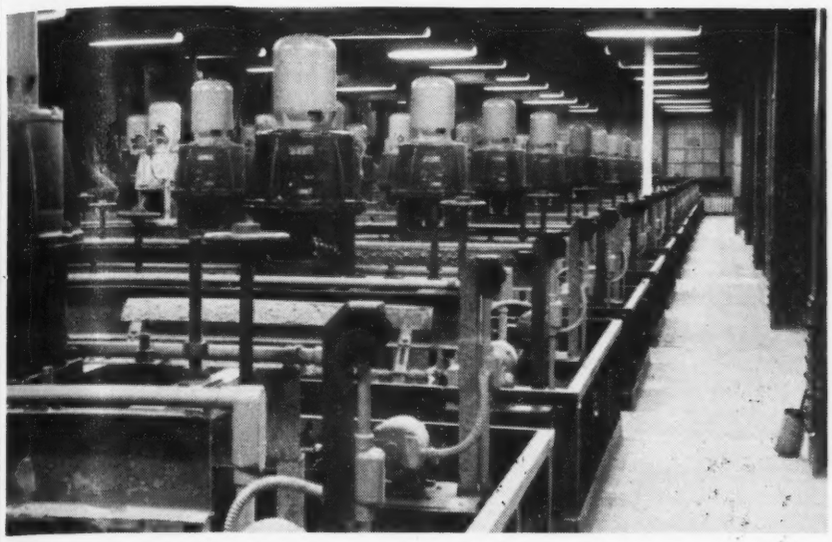
NORALYN PLANT . . . In the feed-preparation section . . .



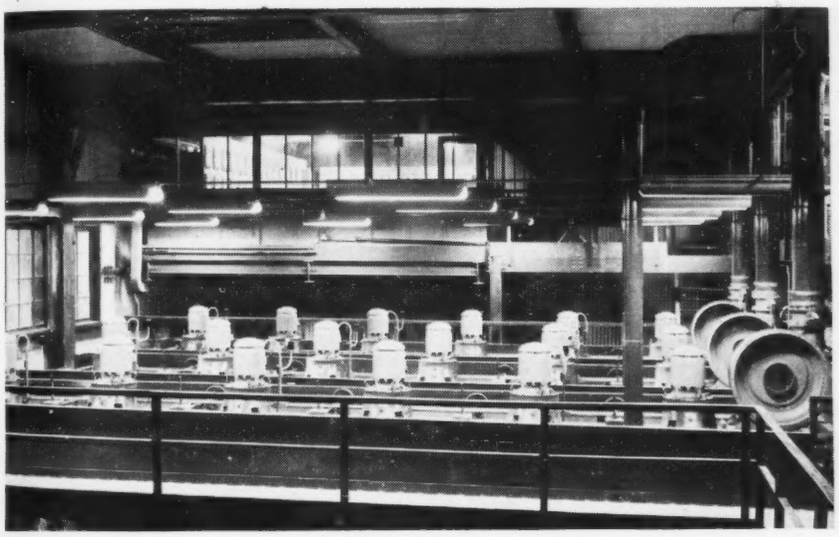
6 FIVE DUPLEX SPIRAL CLASSIFIERS in the feed-preparation section receive the underflow of the 175-ft. hydroseparator. The sands from the classifiers go to trommel screens which split them for flotation.



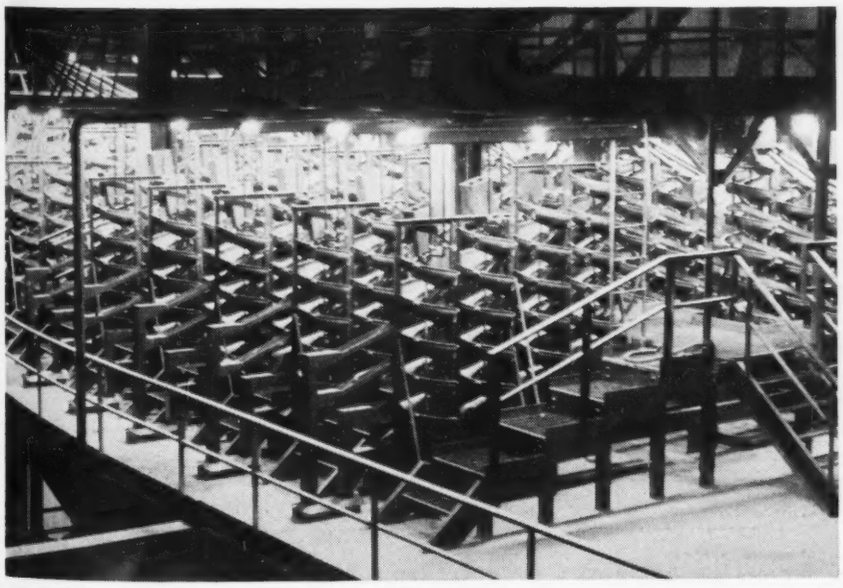
7 THIS BOWL CLASSIFIER, 20 x 42 x 28 ft. in dimensions, has sextuplex rakes. It receives the underflow from the cell-flotation-feed surge bins in the background. Its sands go to the reagent mixers ahead of the rougher flotation machines. At the left is the top of the conveyor gallery going to the flotation building. At the right is part of the pump house.



8 TURBO FLOTATION CELLS are seen here.



9 DENVER CELLS are 18 in number. In background above flotation floor is central control room of plant. Out of the picture, at upper right is the electrical control room.



10 CONCENTRATION ON HUMPHREYS SPIRALS is conducted here. Part of the rougher and middling units are shown. Distributor pipes are seen above.

to supplement the company's existing production facilities. The plant is near Bartow in the Florida pebble field. The company's headquarters are in Chicago.

Louis Ware, International's dynamic president, has played the major role in visualizing and planning his company's expansion of recent years and in finding the necessary financial means. Franklin Farley, Chicago, is vice president in charge of the company's Phosphate Division, and R. B. Fuller is manager of Florida Phosphate Operations, with offices at Mulberry in that state. James A. Barr is the company's chief engineer.

Dr. P. D. V. Manning, Chicago, is vice president in charge of research. Assisting him, in charge of phosphate research, is Dr. I. Milton LeBaron, who is located at the Mulberry offices.

All of the executives named, together with the company's technical staff, have had a part in the successful completion of the Noralyn plant.

Designed to produce 1,500,000 tons of phosphate per annum, the new Noralyn washer and concentrator is the world's biggest phosphate plant and, at the same time, the largest plant engaged in floating a non-metallic mineral. More than mere bigness can legitimately be claimed for it, however. In its generous design and the substantial character of its construction and equipment, it has many outstanding features.

At the Mine

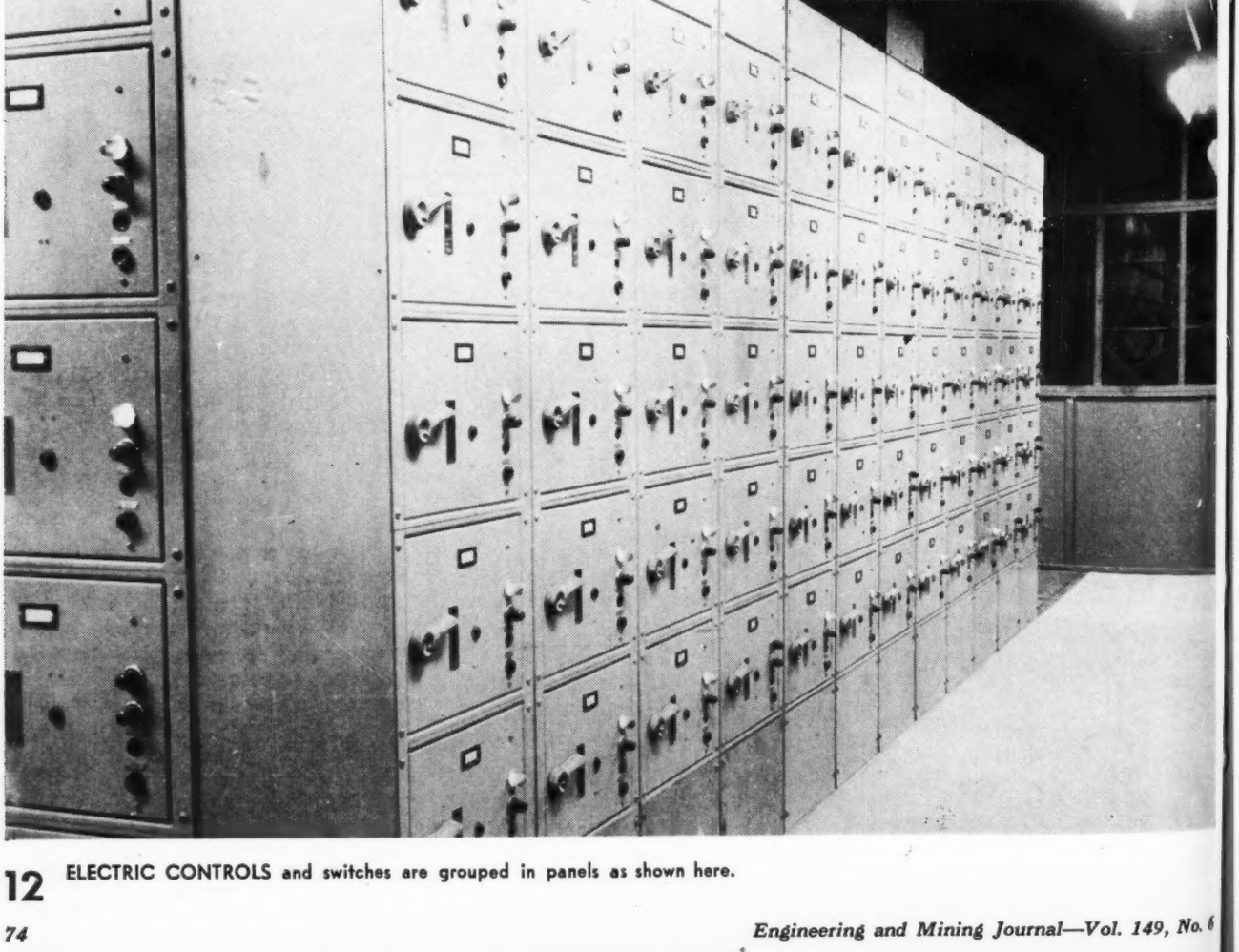
Phosphate matrix supplying the plant comes from the new Noralyn mine, adjacent to the plant. This property comprises over 2,000 acres. Reserves of phosphate are estimated to be sufficient for at least 25 years.

Stripping and mining are done with a new 650-B Bucyrus-Erie electrically-operated walking dragline. Bucket capacity is 18 cu. yd. and boom length 175 ft. Overburden stripped is put back in the mined-out cuts. Matrix is dumped on the bank, and washed by hydraulic giants to a sump, from which it is pumped to the washer with the aid of booster pumps at intervals where needed in the line. Matrix and overburden excavated total 27,000 long tons per 24 hours. About half of this is pumped to the washer.

Washer and flotation plant adjoin. The former is of lower head than practically all other washers in the pebble field. The washer's

NORALYN PLANT . . . Concentrate bins and a control panel . . .

11 FLOTATION CONCENTRATE BINS, having a total of 3,900 tons capacity, deliver directly to railroad cars. The two small bins in front hold 300 tons each, the three in back 1,100 tons each. On top are the concentrate dewatering classifiers.



12 ELECTRIC CONTROLS and switches are grouped in panels as shown here.

LOUIS WARE, President, International Minerals & Chemical Corp.

JAMES P. MARGESON, JR., Executive Vice President

FRANKLIN FARLEY, Vice President, in charge of Phosphate Division

DR. PAUL D. V. MANNING, Vice President, in charge of Research

R. B. FULLER, Manager, Florida Phosphate Operations

J. A. BARR
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DR. I. MILTON LeBARON, in charge of Phosphate Research

LAWRENCE FRYE
Project Engineer

TURNER LOEHR
Chief Electrician

OUTSTANDING FEATURES

In addition to those mentioned, outstanding features of the Noralyn plant are:

1. Feed storage capacity in bins, 25,000 tons.
2. Water used from reservoir, 45,000 gpm.
3. Total pumping capacity in plant, including recirculation, 200,000 gpm.
4. Feed to plant is controlled automatically. Feed is even.
5. Automatic control of all important underflow pumps and control of solids are provided.
6. Automatic control of overflow densities is provided.
7. All regulating devices or controls are brought together in control room inside plant. They are automatic but can be changed and operated manually. All controls are Foxboro and Cutler-Hammer.
8. All electrical controls and switches form panels.
9. All reagents are fed through Fischer-Porter Rotameters, 27 in number, and controlled and recorded at central control room. Reagent temperatures are controlled thermostatically.
10. Thorough desliming is obtained.
11. Plant has two thickeners 383 ft. in diameter for water clarification. General American.
12. New 175-ft. hydroseparator has double-speed rakes, the internal set moving at twice the speed of the wider, outside set. All hydroseparators in the plant are General American.
13. Classifiers comprise nine Dorr FX units, including 28-ft. bowl with 20-ft. sextuplex rakes, for primary feed; also five duplex Akins and one simplex.
14. Water pumps are Allis-Chalmers. Other pumps are largely Georgia Iron Works, some Morris.
15. Most electrical equipment is Westinghouse.
16. All units have individual drives.

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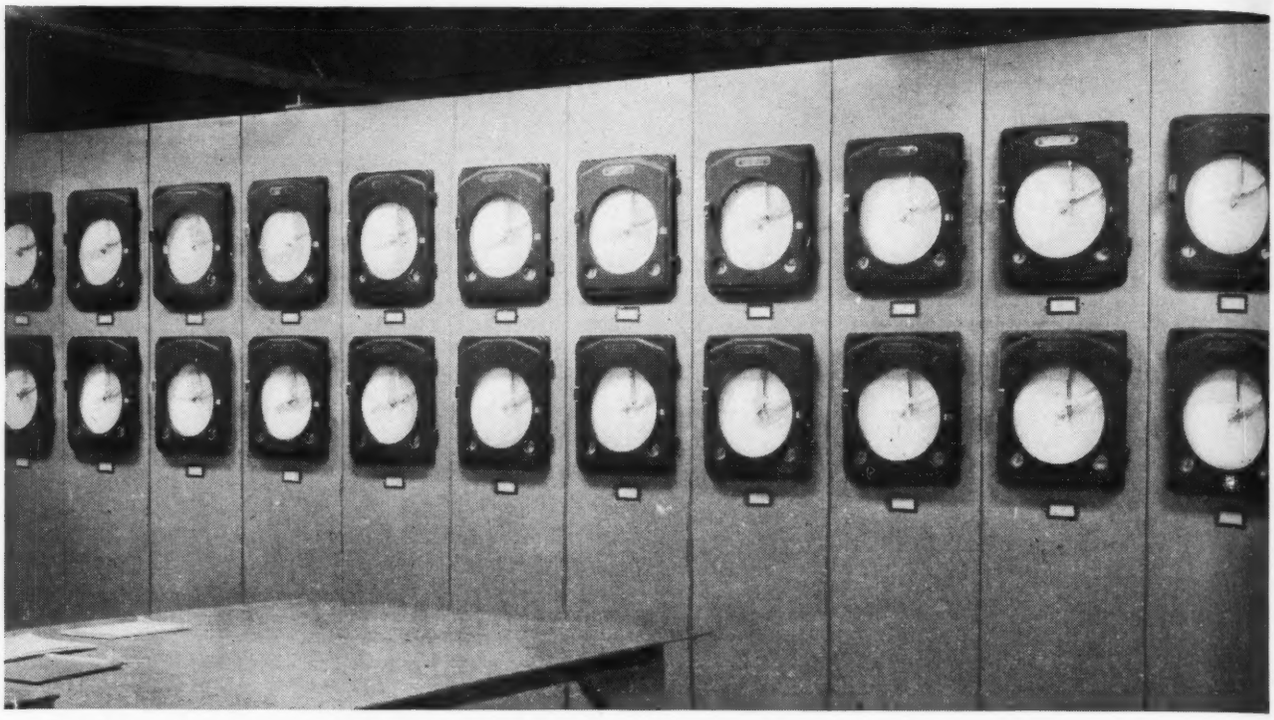
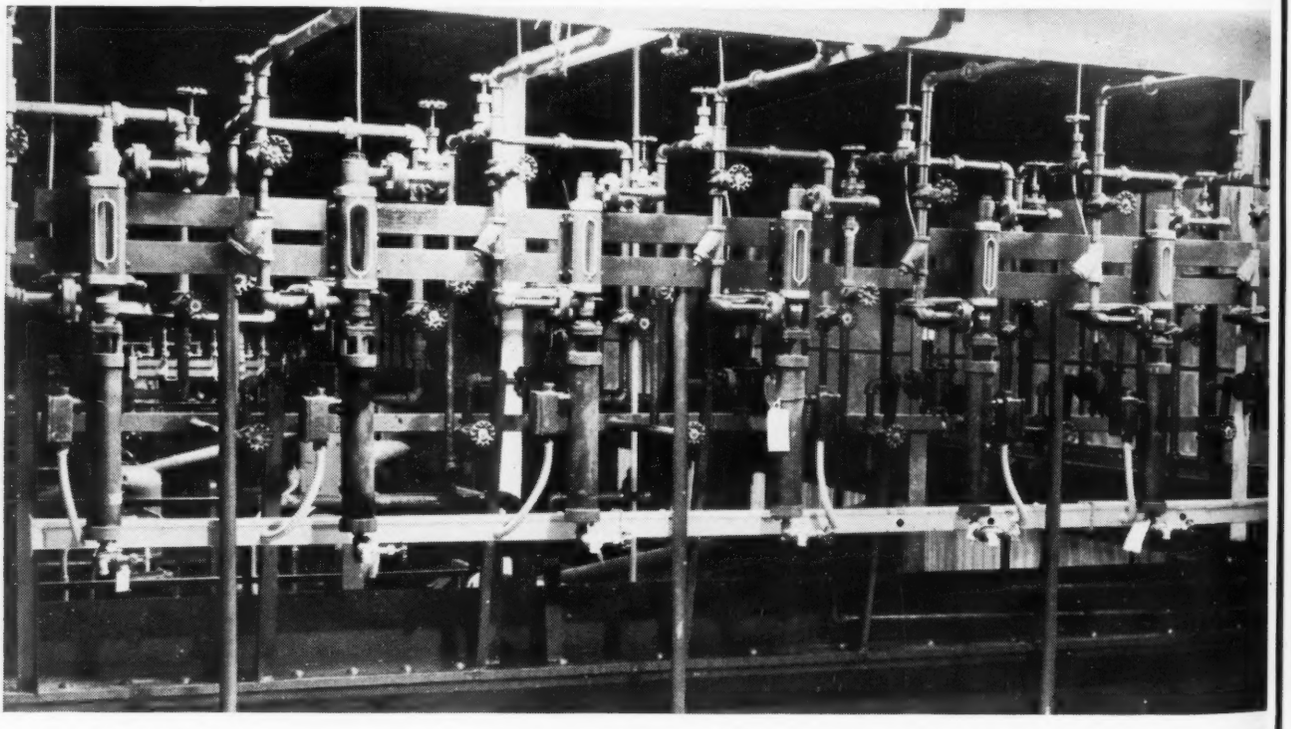


13 FROM THE CENTRAL CONTROL ROOM all plant operations are controlled automatically. Instruments shown here control and record the amounts of reagents fed to the cell flotation section. Reagent temperatures are controlled thermostatically.

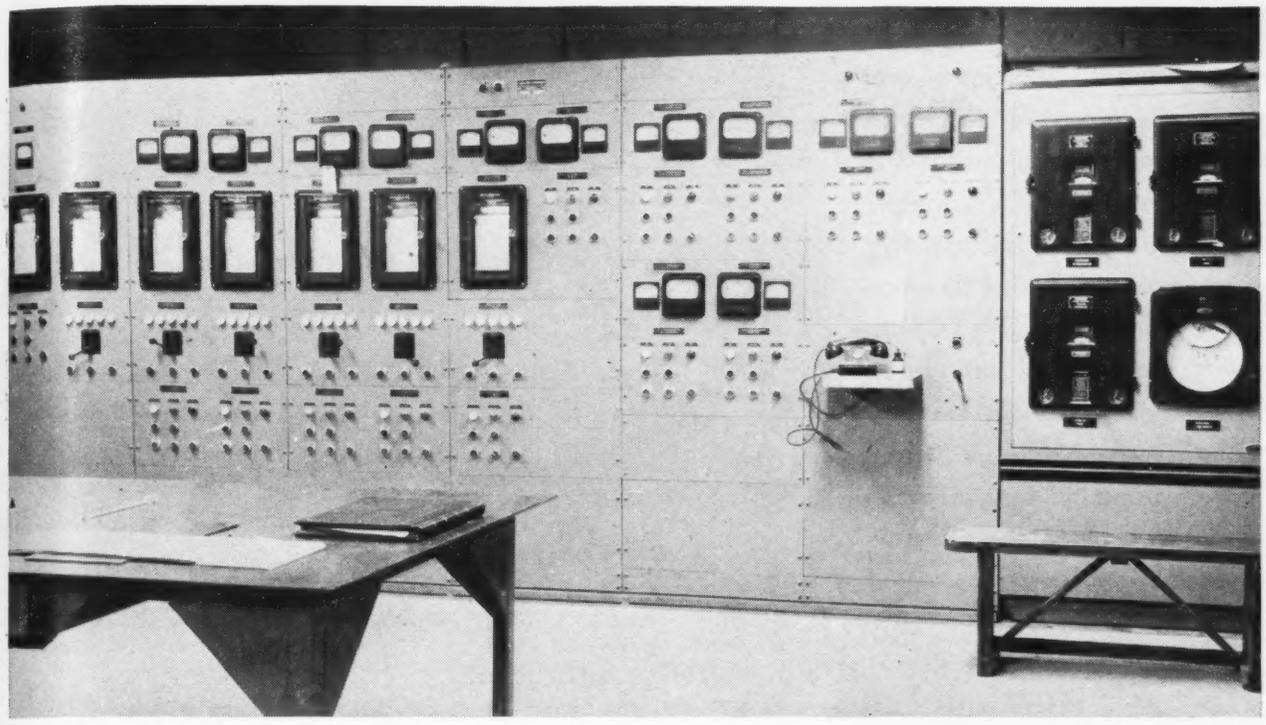


14 A BANK OF ROTAMETERS, controlled from the instruments shown in the room seen in the picture above, feeds reagents to the cell flotation section in quantities desired. The quantities are recorded by the control-room instruments.

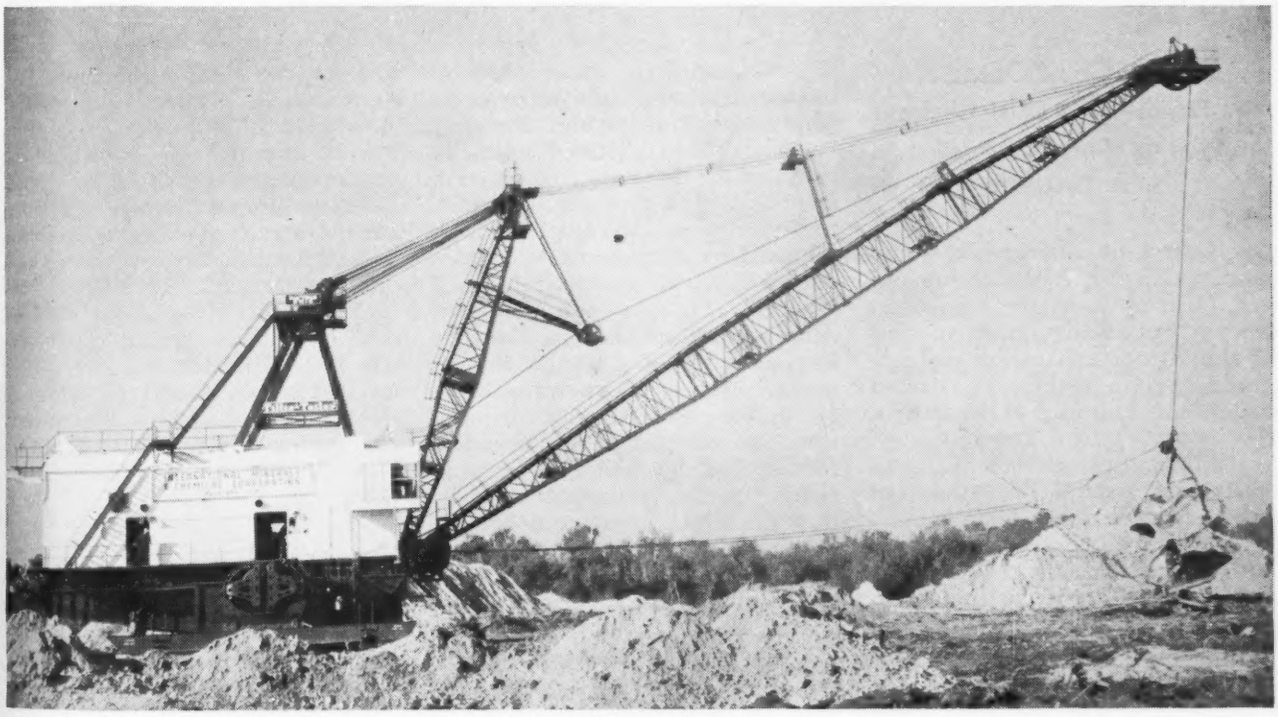
principal feature is that it comprises three sections, each of which can be operated independently of the other two. Otherwise it differs little from older washers in the district. It carries out the first sizing, separating the larger pebble that is shipped to the drying and grinding plant direct. The balance of the material received as feed goes to desliming operations for production of the feed for the flotation plant.

Preparing Flotation Feed

In the feed-preparation section, the flow from the washer passes through a hydroseparator 175 ft. in diameter. Sands are taken out of the underflow on a battery of five duplex Akins classifiers, and are then separated in sizing trommels. The fine fraction goes to flotation and the coarser fraction to Humphreys spirals. (See illustrations of flotation and spiral sections of plant on page 73.)



15 AUTOMATIC CONTROL of plant operations from central control room, here seen again, can be cut out to any desired extent and the control exercised manually thereafter. This panel is at right angles to the one in the picture opposite.



16 STRIPPING AND MINING are done with this 18-cu. yd. walking dragline. Dry mining is practiced. Overburden is placed in the mined-out cut, and the matrix is dumped on the bank. From here it is sluiced to a sump from which it is pumped to the washer.

The Double Float

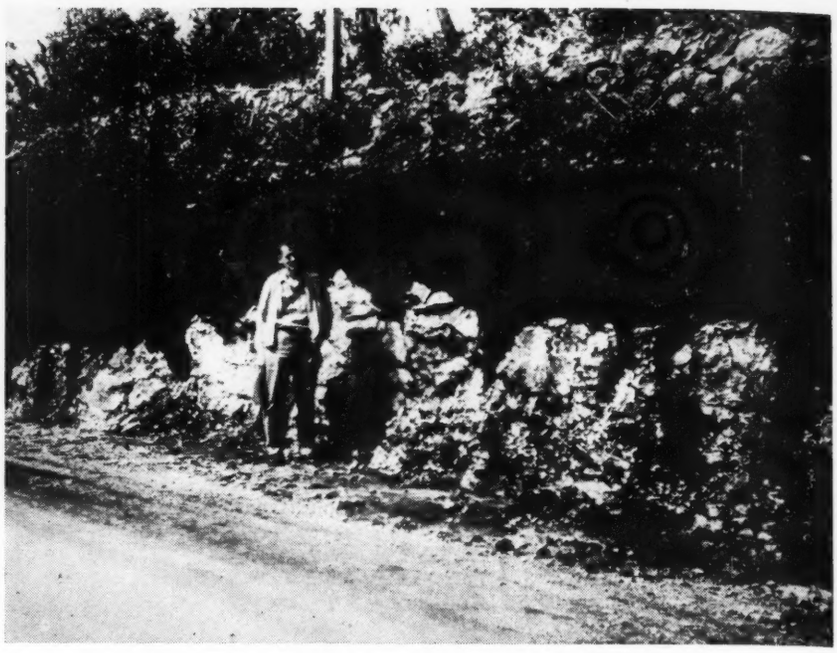
Flotation consists of the fatty-acid float followed by an amine float. For the first, 24 rougher International-Turbo machines are used, followed by a 30-ft. hydroseparator, the underflow of which is cleaned in 18 Denver cells and then re-cleaned in another 18. Rougher tails are treated in 16 scavenger cells, cell tails being treated in another 16 cells.

Silica Is Floated Off

After passing through a series of hydroseparators and classifiers, the concentrate from the fatty-acid float is reagentized with amine and the silica is floated off in 12 Turbo cells.

Inasmuch as the plant has been running but a short time, the results obtained are as yet without significance save for the operating and research staff of the International Minerals & Chemical Corporation.

Immense deposits of a new type of high-quality aluminum ore, constituting one of the foremost mineral resources of the world, have been discovered and proved during the past five years in the islands of Jamaica and Hispaniola in the Caribbean. Though not yet developed, their enormous potentialities in respect to the industrial economy and military strength of North America seem certain of realization during the next decade.



ALUMINUM ORE (dark) above limestone (white) exposed in a road cut, Jamaica.

Caribbean Aluminum Ores

O. C. SCHMEDEMAN
Vice President and Chief Geologist
Reynolds Mining Corporation
Little Rock, Ark.

DISCOVERIES OF HIGH-GRADE aluminum ore on the islands of Jamaica and Hispaniola in the Caribbean are particularly significant in view of the virtual exhaustion of high-grade reserves within the United States, the four-fold expansion of the industry during the past seven years, and the relative inaccessibility and general inadequacy of the Guiana reserves. They are certain to prove decisive in the present struggle to bring genuine competition and vitality to the industry, and their use will undoubtedly involve a major reorientation of its structure, distribution, control and practices. Their abundance and their ease of mining and shipping may well prove equally decisive from a military standpoint in a future emergency.

High-Grade Mostly in Jamaica

The high-grade reserves drilled and sampled to date total at least 350,000,000 tons, of which 90% or more is in Jamaica, and the remainder divided between Haiti and the Dominican Republic. They constitute, without doubt, the world's largest proved reserves of present economic significance.

Basic title in all three countries is vested in the respective governments. In Jamaica, surface rights to the principal deposits have been acquired by three of the four producers of North America: Jamaica Bauxites Ltd., a subsidiary of Aluminum Company of Canada; Reynolds Metals Co., and Permanente Metals Corporation. In Haiti, Reynolds Mining Corporation, a subsidiary of Reynolds Metals Co., has obtained mining rights to the principal deposits through a 60-year concession from the Haitian Government. Alcoa Mining Co., a subsidiary of Aluminum Company of America, has acquired similar rights in Dominica.

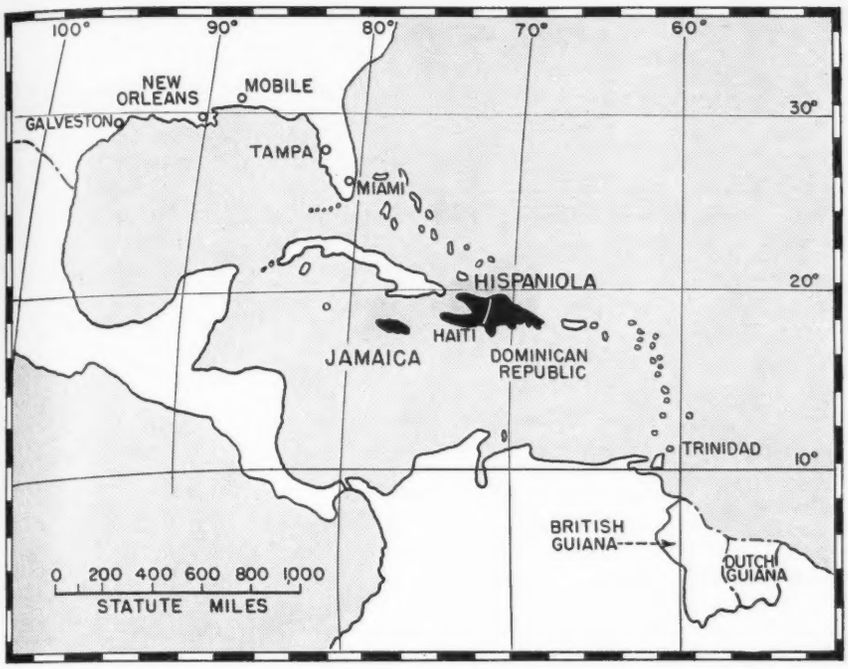
Found Six Years Ago

The initial discovery was made in Jamaica in 1942, and this soon resulted in many others elsewhere in Jamaica, in Haiti in 1943, and in Dominica in 1944. The story behind these discoveries is unusual:

For several years prior to 1942 Sir Alfred H. D'Costa, of Kingston, attempted to improve the fertility of the red soil areas of his 4,000-acre cattle ranch near Claremont in the Parish of St. Ann, Jamaica. Investigations made for him by the local Department of Agriculture revealed that these soils had an unusually high content of alumina. To obtain more information, Sir Alfred in mid-1942 sent several samples to a London laboratory. Resulting analyses showed a uniformly low content of silica, of the order of 3%, and an alumina content of about 50%—a good quality of aluminum ore. By late 1942 this initial discovery had resulted in recognition of ore elsewhere in the island, and in intensive exploration by N. V. Billiton Maatschappij, and Aluminum Company of Canada. Billiton, however, withdrew before the end of 1943. Reynolds Metals started active exploration and acquisition of property rights in 1944, and Permanente Metals Corporation in 1947.

The Haiti and Dominica deposits were found as a consequence of the Jamaica discoveries, but in a different way. Both resulted from deliberate search by mining companies with no prior direct leads. Excellent indirect leads, however, were obtained through close study of the reports[1, 2] covering geological reconnaissances in Haiti and the Dominican Republic by the U. S. Geological Survey parties in 1918-1921.

The first discovery in Haiti was made by a field party of Reynolds



JAMAICA and Hispaniola are closer to aluminum-producing centers than the Guianas.

Mining Corporation near Beaumont, Department du Sud, in August, 1943. Recognition of the principal Haiti deposit, Ste. Croix near Miragoane in the same department was effected the following month by aerial reconnaissance and quickly verified by ground investigations. Additional deposits were later found elsewhere in Haiti in the same manner.

In late 1943, Reynolds Mining Corporation crews extended their investigations to the Dominican side of the island, and were followed by a party from the Alcoa company. Discoveries were made by both groups in the early part of 1944. The deposits recently have been described by Goldich and Berquist.[3]

Delay in Discovery Amazing

It is astonishing that mineral deposits as vast as these and in such well-settled and traveled countries, particularly as Jamaica, could escape recognition until so recently. In one sense, this encourages the belief that other important reserves of aluminum and other ores may also remain to be found in equally obvious locations. However, it is disturbing to realize that although these ores had been seen and recorded by numerous geologists, engineers, and soil chemists, their true character and economic worth remained unrecognized until Sir Alfred D'Costa's fortuitous discovery in 1942.

Sawkins,[4] in his comprehensive study of the geology of Jamaica made in 1863, reported that the colored soils on the "White Limestone" were unusually high in alumina and iron and low in silica. Although he did not recognize their economic value, this was undoubtedly due to the fact that there was at that time no economical process for the recovery of aluminum from any ore.

Later reports of geological studies in Hispaniola by the U. S. Geological Survey,[1, 2] and in Jamaica by Hill,[5] all refer to the red soils in the limestone areas as clay. As recently as 1941, a geological field party of experienced personnel visited and sampled one of the deposits of the Beaumont district in Haiti, but failed to recognize it as aluminum ore. Analyses were made for certain constituents, but none for alumina.

Ores are Different

The Caribbean ores differ markedly in character and mode of occurrence from those used to date in the Western Hemisphere, but in both respects are like those of France, Hungary, Yugoslavia, Italy and Greece, used by the European aluminum industry. They are essentially residual soils derived from limestone, and accumulated at the present erosion surface in irregular depressions in the same limestone.

The limestone is thick-bedded, white to light gray, coraliferous and extremely pure; $CaCO_3$ averaging better than 99%. Al_2O_3 ranges from traces to 0.6%, Fe_2O_3 from traces to 0.2%, and silica from nil to traces. Its exact age in each country is somewhat uncertain; published data ranging from Middle Eocene to Upper Oligocene. General observations indicate that this formation before erosion attained a thickness of well over 2,000 ft. in both Hispaniola and Jamaica, and it is possible that deposition may have extended from the Eocene into the Oligocene.

Stripping Unnecessary

Although Miocene and later sediments cover the "White Limestone" along the fringes of the islands, there is no trace of such later formations inland in the areas where the orebodies occur. This fact is of double significance. It means there is no overburden to contend with, either in exploration or mining, and furthermore, that the ores have been derived from their present host, the "White Limestone" and not from some younger capping.

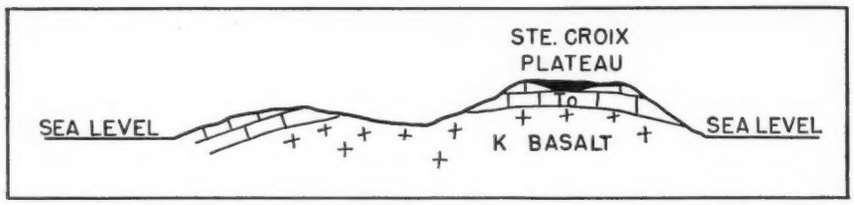
Since late Oligocene or early Miocene times this parent limestone has stood above sea level in extensive plateaus. In Hispaniola, structural dislocations and erosion have largely destroyed the original plateau and left only small disconnected remnants. In Jamaica, about 2,000 sq. mi. of the original plateau still exist, though in a much modified form as a consequence of major block-faulting, and solution etching on a massive scale. This pitting or etching of the Jamaica limestone plateau has developed a classic *karst* topography.[6]

Deposits in Catchments

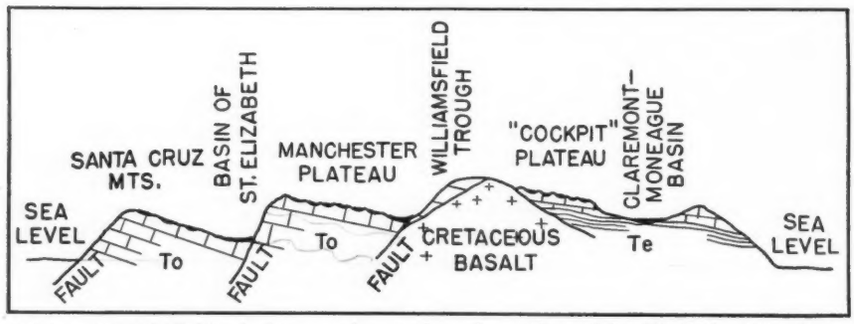
In these etched depressions on the broken plateaus of both Hispaniola and Jamaica the principal accumulations of aluminum ores have been formed. These catchments range from sink holes of 50 ft. in diameter to huge bowls up to 10 miles in diameter, and troughs nearly 20 mi. long.

The deeper these depressions have been etched into the limestone, the thicker are the deposits of ore. Likewise, the larger they are, the greater are the orebodies in area.

The principal orebodies occur at the bottoms of the major depressions, though frequently subsidiary depressions on the slopes of the larger bowls or troughs contain important deposits. Similarly, hummocks of ore sometimes occur in



SCHEMATIC SECTION 18 miles long, looking west, through southwest peninsula of Haiti, showing setting of aluminum ore deposits of Ste. Croix District.



AN 80-MILE SECTION, looking northwest, through parishes of St. Elizabeth, Manchester and St. Ann, Jamaica, showing setting of principal deposits.

Table I, Log of Drill Hole, South of Claremont, Jamaica

Depth in Feet From	To	Ignition Loss	SiO_2	Fe_2O_3	TiO_2	Al_2O_3
0.5	5.0	26.47	1.13	20.60	2.60	49.20
5.0	10.0	25.95	0.64	19.30	3.00	51.11
10.0	15.0	27.30	0.24	18.20	2.70	51.56
15.0	20.0	26.72	0.72	18.30	2.40	51.86
20.0	25.0	26.14	0.83	17.70	2.40	52.93
25.0	30.0	26.40	0.82	18.00	2.50	52.38
30.0	35.0	26.51	0.69	18.00	2.10	52.70
35.0	40.0	26.69	0.72	17.50	2.20	52.89
40.0	45.0	27.64	0.17	16.10	1.80	54.29
45.0	50.0	26.95	0.52	17.60	2.10	52.83
50.0	55.1	26.83	0.51	17.50	2.10	53.06

Limestone encountered at 55.1 ft. from surface.

Table II, Log of a Hole Showing High Silica

Depth in Feet From	To	Ignition Loss	SiO_2	Fe_2O_3	TiO_2	Al_2O_3
0.5	5.0	25.46	2.35	21.70	2.70	47.79
5.0	10.0	25.45	1.48	20.60	2.40	50.07
10.0	15.0	25.03	1.87	19.90	2.40	50.80
15.0	20.0	25.30	1.65	19.30	2.30	51.45
20.0	25.0	25.78	1.92	18.50	2.70	51.10
25.0	30.0	25.46	3.45	17.90	2.40	50.79
30.0	36.6	22.44	10.71	16.20	2.00	48.65

Limestone encountered at 36.6 ft. from surface.

the bottoms of bowls, as a consequence of solution stoping around their peripheries and collapse of the former walls.

Elevation of the deposits ranges from as low as 250 ft. above sea level near Pestel, Haiti and in the Parish of St. Elizabeth, Jamaica, to over 5,000 ft. in Dominica. Ste. Croix, the principal deposit in Haiti, lies at an average elevation of approximately 2,700 ft. above sea level. Elevations of the principal deposits of the Parish of St. Ann in Jamaica range from 1,000 to 2,000 ft., and those of St. Elizabeth from 250 to 750 ft. above sea level.

Despite the relatively high elevation of some of the deposits, none is more than 15 miles in a direct line from the sea coast, and large tonnages, particularly along the north shore of Jamaica, and at Ste. Croix in Haiti, are within 6 miles of it.

Jamaica Has Largest Deposits

The largest orebodies occur in Jamaica. In the great Williamsfield trough, in the Parish of Manchester, there is a virtually unbroken accumulation extending nearly 20 miles from Porus to the neighborhood of Balaclava. In the Parish of St. Elizabeth, a similar accumulation extends 10 miles from Lititz to Santa Cruz. The largest of the bowl-type fillings occurs in the Parish of St. Ann in the neighborhood of Claremont and measure a square mile or more in area.

In Haiti, the orebodies of the Ste. Croix district, though very irregular in outline, form a continuous chain measuring about 4½ miles along the major axis.

Tonnage of individual orebodies ranges from a few thousand to tens of millions, depending largely on what thickness cut-off or property boundary is used in the computation. As defined in mining estimates, the average orebody is of the order of 500,000 tons.

Thickness ranges from a few inches to over 100 ft. The thickest ore proved by Reynolds Metals Co. is 114 ft. near Williamsfield, Jamaica. Ores less than 5 ft. thick are generally considered too thin for economical mining. Average mineable thickness is of the order of 25 ft. in Jamaica, and considerably less in Haiti.

Silica Unusually Low

Two of the outstanding characteristics of the Caribbean ores are uniformity in respect to quality and an unusually low content of silica. This is particularly pronounced in an individual drill hole, nearly as much as in a district as a whole, and to a large degree is true from one country to another.

The average drill hole starts in good ore and bottoms on limestone in ore of practically the same grade, though as a rule silica and iron show a slight decrease, and alumina a corresponding slight increase. Table I gives a complete log of a hole drilled at a point south of Claremont, St. Ann, Jamaica, which is typical of this general trend.

Some Instances of High Silica

Occasionally, and particularly in orebodies near the basal contact of the "White Limestone," there is a reversal of the general rule. The log of a test pit at a point east of

Claremont, St. Ann, given in Table II, illustrates such a case. The high-silica content in such instances is probably due to contamination from inwash of clay soils resulting from weathering of nearby sedimentaries, topographically above, but stratigraphically below the "White Limestone" series.

Alumina Averages 50%

In both Haiti and Jamaica the average alumina content of all ores drilled and sampled by the Reynolds company is practically an even 50%. This varies somewhat from one district to another, but for any sizable tonnage it is never less than 47% or more than 52%. The average is appreciably less than in most high-grade ores, which generally contain from 54% to 60% alumina. This fact, together with some erroneous estimates of the average alumina content, which have received some publicity, accounts in considerable measure for a prevailing impression that the Caribbean ores are of poor quality.

Although the alumina content is relatively low, it is largely offset by an unusually small percentage of silica. The average silica content is in the neighborhood of 2% or less. Deposits averaging more than 5% silica are uncommon, and many large orebodies of the order of a million tons or more contain less than 0.75% silica. The usual high-grade ore used in North America contains 3% to 7% silica, and the low-grade Arkansas ores now used contain 10% to 20%.

The "Index" for Comparing Ores

In aluminum ores, silica is doubly objectionable. It lowers the amount of alumina which can be economically recovered, and it combines with and carries away a costly reagent, soda ash. The net effect is that each unit of silica subtracts the equivalent value of two units of alumina. The comparative value or "index" of aluminum ores can therefore be expressed as:

$$\text{Index} = \%\ Al_2O_3 - 2\,(\%\ SiO_2)$$

Thus, the average Caribbean ore containing 50% Al_2O_3 and 2% SiO_2 has an index of 46 as compared to an index of 50 for the average Guiana or Arkansas high-grade ore containing 58% Al_2O_3 and 4% SiO_2, and an index of 24 for the average low-grade Arkansas ore being used at present.

Iron Content Inert

Iron in Caribbean ores is in the ferric condition in the form of hematite and various hydrated oxides. The content is about the same as in other ores derived from limestone, but considerably higher than in the usual ore heretofore used in North America. The average for all Caribbean ores is in the neighborhood of 20%, as Fe_2O_3, and is rarely less than 15% or more than 25%. In the Bayer process, iron is completely inert, and objectionable only as a diluent which reduces the alumina content.

Combined water, which is customarily reported together with minor volatiles as "Loss on Ignition," ranges from 18% to 30%, and shows the most variation of any constituent from one district to another. This is a consequence of varying degrees of hydration of both the iron and aluminum oxides.

Titanium oxide is present generally in amounts ranging from 1.75% to 2.75%, and averages about 2.25%. This is a normal amount for aluminum ores.

Principal minor constituents are manganese and phosphorus which are present in varying amounts averaging in the neighborhood of 0.5% each as MnO_2 and P_2O_5. In a few orebodies, near the basal contact of the "White Limestone" series, P_2O_5 is present in amounts in excess of 2% but such instances are rare. No other minor constituents are present in excess of 0.1%, though traces of 47 elements have been reported from spectrographic analyses.

Physical Characteristics

The soil-like nature of the ores is pronounced at and near the surface, particularly where they have been in cultivation. In depth they are considerably more consolidated, though rarely are they indurated to the extent that they may be termed rocks. Hand drilling with earth augers has been successful in penetrating them in all but a few instances. Drilling and blasting will probably not be necessary in mining, provided shovels or draglines of 2½ cu. yd. capacity or greater are employed.

Coloration is pronounced, ranging in general from a light yellow to tan and from a yellow brown to reddish brown and magenta. White, black or green ores are rare. A single exposure is seldom of mottled appearance, though there are frequently wide variations in color throughout a single orebody. Streaking is, however, quite common as a result of hydration and leaching of iron along minor fracture planes or root channels. The alumina content of such veinlets frequently exceeds 55% as a result of the subtraction of iron.

Ores Very Permeable

The ores are uniformly very porous and extremely permeable. Determinations of 72 Haiti and Jamaica samples show an average porosity of 50.1%, with extremes of 38.0% and 66.7%. The samples on which these determinations were made were collected at depths from 1 ft. to 45 ft. below the surface. In general, the deeper samples showed a lower porosity than those from nearer the surface.

Free moisture content is also high, 72 specimens from Haiti and Jamaica averaging 23.1%, with extremes of 17.6% and 30.3%.

The extremely high permeability of these ores is striking. All but the most torrential rainfalls are immediately absorbed, and run-off is negligible except in such cases, it then taking the form of sheet wash. As a consequence of this extreme permeability, no water stands or runs on the surface of these ores except at the height of extremely heavy rains, or in artificially constructed ponds. The ores stand remarkably well for long periods in vertical banks without noticeable sloughing or eroding and this characteristic provides an excellent visual method of differentiating between the colored clay soils and the colored ore soils. The limestone under the ores is also highly permeable and provides subterranean drainage for all water passed through the ores.

The mineral density of the ores ranges from 2.7 to 2.9 and averages about 2.8. Due to the high porosity, the bulk density is greatly reduced, averaging 1.4 on a dry basis and 1.7 on a wet basis.

The individual particle size is extremely fine, generally in the range of 0.1 to 1.0 micron. Consequently, no information as to the mineralogy of the ores can be obtained from microscopic investigations. X-ray studies show, however, that they are highly crystalline.

These investigations, together

with differential thermal analysis studies, chemical analyses and digestion tests, indicate that most of the aluminum in both the Haiti and Jamaica ores is in the form of gibbsite, and that the remainder is present in the form of boehmite. Diaspore is rare or absent. The ratio of gibbsite to boehmite varies considerably between the three countries and between districts within each country.

Hematite predominates over the hydrated iron oxides, but the ratio varies considerably. In general, the ores highest in hematite contain more boehmite than those in which the hydrated iron oxides predominate.

Development Retarded

Only a few thousand tons of ore, for testing purposes, has been mined to date. Development has been retarded for several reasons, primarily because three of the companies controlling proved reserves each have fully developed mines elsewhere adequate for their immediate needs. The physical and chemical differences between these ores and those used at present in North America have necessitated research as to treatment and this has been a contributing factor to the delay.

Large-scale development may be still a few years off as a consequence of the heavy investments involved in duplicating present mining facilities now located in the Guianas and in Arkansas, and to provide on the Gulf Coast new facilities for the production of alumina to replace those now located inland for treatment of domestic ores.

Excellent but undeveloped deep-water harbors are available in Haiti and along the north coast of Jamaica. Transportation of the ore to the shore presents the principal difficulty, and for large-scale production cross-country conveyor belts will probably prove the cheapest overall solution for many of the deposits. Rail transportation is not feasible in Haiti or Dominica, though some of the Jamaica ores, particularly those in St. Elizabeth, could be moved to the coast by rail. Truck haulage is feasible but would not be competitive with belt or rail haulage for large tonnages. The principal deposits are well adapted for mining by large earth-moving equipment without blasting or other preparation except removal of a few inches of top soil.

From 1918 to 1943 the productive capacity of primary aluminum in this country increased from about 75,000 tons per year to 1,100,000 tons. With Canada included, the total capacity of North America reached 1,600,000 tons in 1943, requiring approximately 6,500,000 tons of high-grade ore, or 8,000,000 tons of the quality of the remaining domestic reserves. With the constantly increasing new applications being found for aluminum, it is probable that the annual demand for ore in another 25 years will exceed 15,000,000 tons per year.

Present domestic reserves of recoverable ore are of the order of 35,000,000 tons with an unusually poor chance of being increased substantially by new discoveries. Through drastic measures and much good fortune domestic production was increased from a prewar average of around 300,000 tons per year to over 6,000,000 in 1943. This was possible because of the availability in Arkansas of numerous shallow deposits of good to high-quality ore which could be mined quickly by open-pit methods. The drain on such deposits was so great that they are now largely exhausted, and the bulk of the remaining reserves are not only of poor quality but require either heavy stripping or underground mining. It is too much to say that domestic mines could never again yield 6,000,000 tons per year. It would be most imprudent, however, to count on them for much help in a future emergency, particularly as the total reserves are only about double the probable total annual demand.

Guianas' Capacity Limited

The imported ores upon which the industry has become increasingly dependent during the past 25 years have come almost entirely from Dutch and British Guiana. Of the four producers of primary metal in North America, two are wholly dependent on such ores, one largely so, and only one is supplied entirely from domestic sources at present. The present capacity of the Guianas to provide necessary imports is so limited that a substantial amount of ore is now having to be imported from the Island of Bintan, off Singapore, nearly 12,000 miles away.

The inadequacy of the Guianas as a source of emergency imports was conclusively demonstrated in the past war. In contrast to a 20 to 1 increase in domestic production, the Guiana mines were unable to expand their production by more than 5 to 1. In the peak year, despite the most urgent measures, they were able to deliver only 3,600,000 tons at a terrific cost in shipping space, and lost vessels. Over 100 ore carriers and escort vessels were sunk by submarines, and an immense amount of shipping allocated for the 2,500-mile haul to Gulf Coast ports. A good part of the difficulty was due to the fact that the ore had to be transported in small vessels or partially loaded larger boats by river from the mines to the sea and over the shallow bars at their mouths to Trinidad, there to be unloaded and transferred to larger vessels.

Development of the Caribbean deposits on a large scale offers the best hope of providing necessary future emergency imports. They require no stripping, and capacity can be increased greatly in a matter of days or weeks. They can be transported to the shore in any desired volume on the land by reliable methods, and loaded directly into the largest carriers at deep-water ports only 1,000 nautical miles from Gulf Coast ports. In addition, the sea route is everywhere close to land and can be effectively patrolled by land-based aircraft operating from many bases enroute.

As has been pointed out, facilities for large-scale production may not be installed for several years. Accordingly, in the event of an emergency at an early date, a delay of at least a year and a half would be suffered in the installation of transport, harbor and shipping facilities for volume production. Development would begin immediately, however, should the ores be required by the Army-Navy Munitions Board for stockpiling.

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SHAFT MUCKER LOADS 21-cu. ft. sinking bucket in two minutes at Mayflower shaft

Power Shovel Principle Is Used in Shaft Mucker

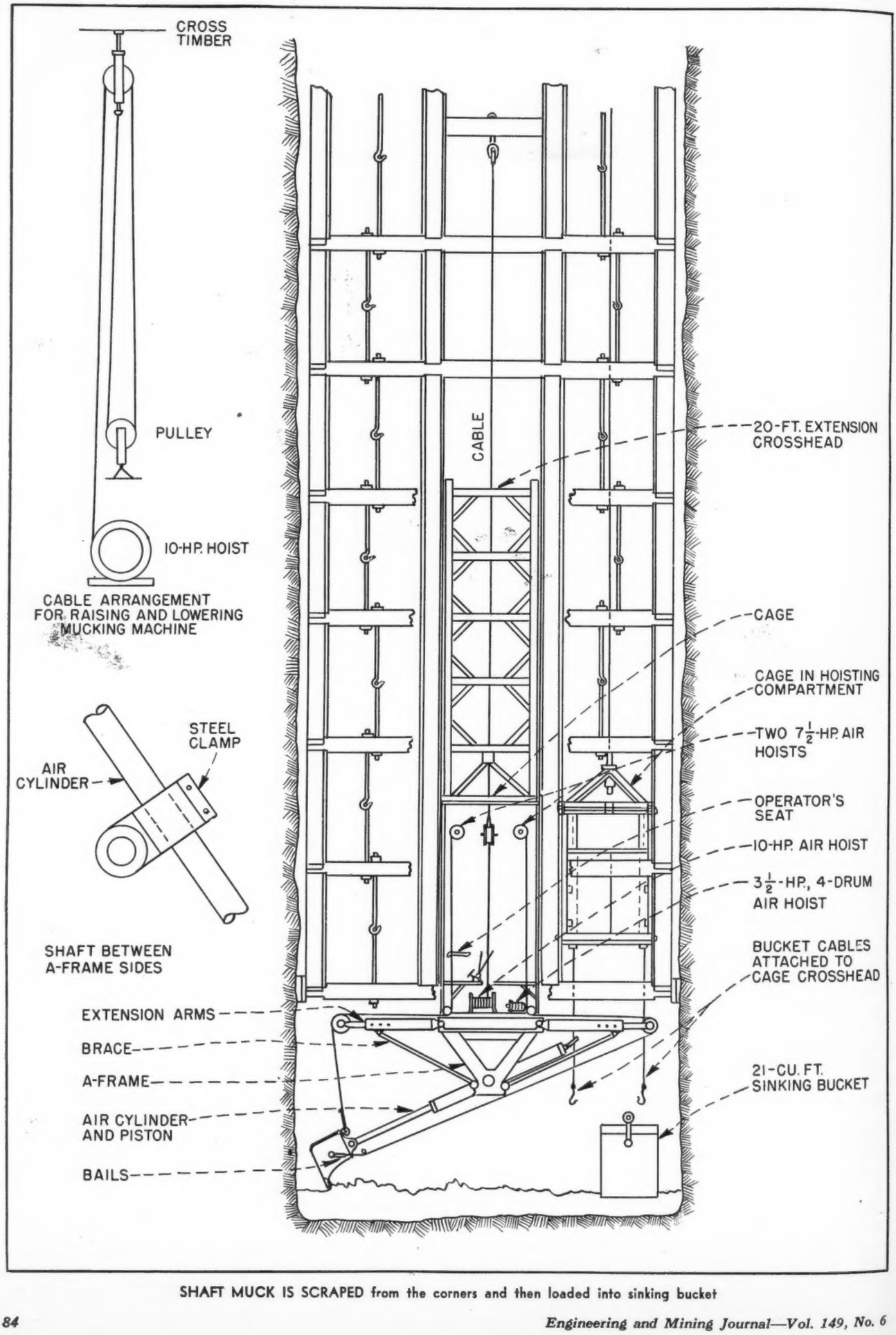
JOHN B. HUTTL
Associate Editor

OF THE FOUR PHASES — drilling, blasting, mucking, timbering— making up the complete shaft sinking cycle, mucking is perhaps the most tedious and time-consuming. For years mining men have worked on machines to do this job. A partial answer to the problem was found in the mechanical mucking pan, which speeded up mucking operations, but did not eliminate hand labor appreciably. Progress in mechanizing shaft mucking work has been rather slow, chiefly because of the difficulties facing the designer in perfecting a loading machine simple in layout, but powerful and flexible enough to operate in the restricted space in shaft bottoms. Of the many digging and loading units available for incorporation in the design of such a machine, choice narrowed down to three — namely, the scraper, clamshell, and the power shovel loader. Some of the machines perfected recently and employing one or the other of these digging principles are now in actual operation.

An interesting shaft mucking machine employing the power shovel loader principle is now operating successfully in the Mayflower shaft of New Park Mining Co., Keetley, Utah. It was developed and patterned by M. N. Boskovich, of Midvale, Utah, a shaft contractor well known in the Salt Lake mining area. The current model was constructed in the machine shop of New Park Mining Co. Arthur Hall, mining engineer, is co-inventor. The machine is used for loading broken rock into 21-cu. ft. sinking buckets.

The cross-section of the Mayflower shaft now being deepened from the 1,470 level to the 1,850 level is 17x7 ft. It is divided into three compartments, two measuring 4½x5½ ft., and the third 5x5½ ft. inside the 8x8-in. timbering. The shaft makes considerable water, and the rock drilled and blasted is hard. Before installation of the shaft mucking machine it required 9½ shifts (average working time per shift about 5½ hr.) to complete a 5-ft. advance, according to Clark L. Wilson, superintendent. Division is as follows: Mucking, 6 shifts; drilling, 2 shifts; and timbering, 1½ shifts. Installation and use of

Shaft Mucker Operates on Power Shovel Principle



SHAFT MUCK IS SCRAPED from the corners and then loaded into sinking bucket

the mucking machine has cut these figures to 2, 1, 1, respectively, or a total of 4 shifts. Shaft sinking is done on a two shift basis. A total of six men are employed during this period. This includes four men at bottom of shaft, and a hoistman, and a pump man furnished by the company. Time required to load a 21-cu. ft. sinking bucket averages 2 min., and the complete loading-hoisting-dumping-lowering cycle is completed in 3 to 4 min.

The shaft mucking machine shown here is operated in the center compartment of the shaft. It consists of a cage about 10 ft. high, and a digging and loading assembly attached to the bottom of the cage by means of a heavy steel A-frame. The cage is fitted with a 20-ft. extension crosshead to permit operation of the mucker below the lowest timber set. The cage contains a seat for the operator; a 10-hp. air hoist to raise and lower the cage through the block-and-tackle arrangement shown; two 7½-hp. air hoists to advance and retract the dipper unit before and after crowding; a 3½-hp., four-drum hoist to move dipper and cable pulleys from side to side; and the foot level assembly to control the crowding motion of the dipper attached to the end of the air piston.

Air Cylinder Moves Dipper

The digging and loading element at the bottom of the cage is made up of a long air cylinder and piston fitted at one end with a 20x20-in. dipper, and operating in a pivotal manner on the heavy steel shaft installed at the bottom of the A-frame mentioned previously; four adjustable steel arms extending from the A-frame sides toward the end walls of the shaft; four steel braces; and two steel shafts, one at each end of the two arms, on which are mounted the pulleys guiding the cables that provide the power to pull the dipper forward for loading, and back when empty. The air cylinder is bolted to the steel clamp operating on the shaft at the bottom of the A-frame. Distance of travel of piston and dipper and proper dumping point can easily be adjusted without moving the cage itself by simply changing the position of the air cylinder in the clamp. Improvements planned include use of two air cylinders in place of the present four-drum hoist to move the air cylinder assembly and cable pulleys and blocks on shafts at the end of the extension arms from one side of the shaft to the other. This will give the operator more room in the cage and greater view of the area to be mucked. A set of three cables will be used on each side of the cage, all attached to the end of each piston. Raising of one piston will instantly pull the respective rolling blocks, and sliding shaft collar towards the desired side of the shaft. Reciprocally, raising of second piston will pull the entire shovel assembly to the opposite side of the shaft.

Dipper Construction

The dipper is fitted with two steel bails. Attached to these are the cables which travel over the pulleys on the shafts at the ends of the extension arms to the 7½-hp. hoists in the cage above the operator's platform. The bottom of the dipper is provided with a closure plate held shut by a spring catch which is automatically released by a set chain when the dipper has reached the dumping point.

Heaps of broken rock building up gradually at the ends of the shaft can be scraped toward the center for subsequent loading by simply reversing the cables on the dipper. This changes the movement of the dipper to that of a scraper or trench digger.

It is also possible to use the air cylinder assembly as a pneumatic drill column, thus permitting the use of drifters in place of the conventional sinker drills. The machine can be removed to a protected position after completion of mucking operations without removing or taking apart a single major unit. All that is required is the removal of pins holding together the forked union between extension arms and braces. Then the disconnected arms, braces, and cross shafts are lowered until they hang vertically below the cage. The arms are telescopic and may be shortened and lengthened as required. Special provision has been made for adjusting the digging pitch or angle of the dipper. Raising of the entire shaft mucking assembly into sheltered position, and lowering it to position for mucking is accomplished by means of the 10-hp. hoist installed near the floor of the cage. The hoisting cable used for this operation passes over a sheave block suspended from timber up in the shaft and runs down again to the top of the cage.

The mucking machine is operated by two men, one at the controls in the cage, and the other at the bottom of the shaft to spot buckets and switch the main hoisting cable from empty to full buckets. The operator's seat is on the floor of the cage. All controls are conveniently arranged directly before him. Flexibility of the machine permits several mucking setups — namely, (1) single bucket operation, as in the Mayflower shaft, and (2) loading into two buckets which are alternately spotted at opposite sides of the shaft and under the end compartment through which hoisting is done. After completion of mucking operation and during timbering, arms of the machine may be retained in place, and a few planks thrown across to form an excellent platform for placing shaft timber sets.

Advantages of Unit

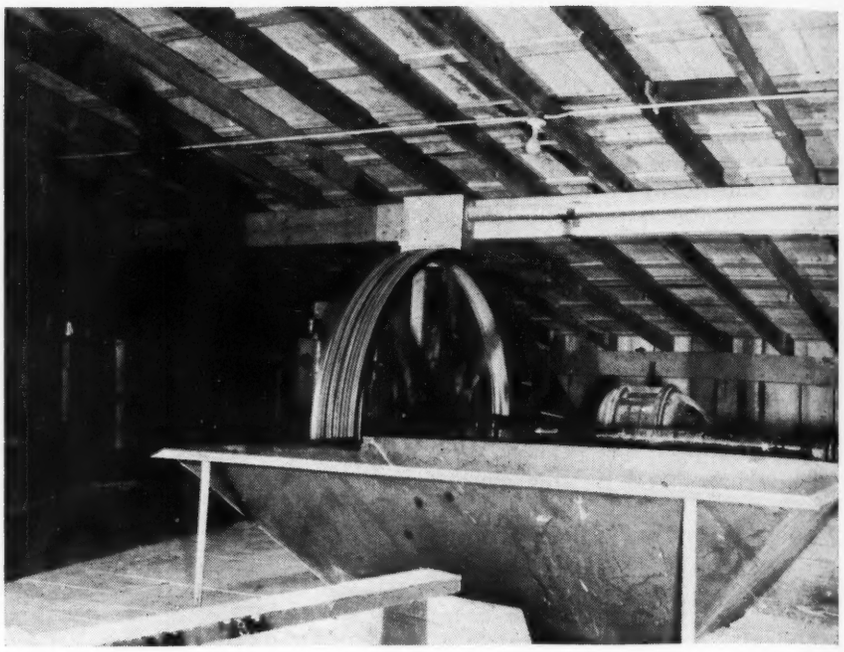
Many months of successful operation in the Mayflower shaft has proved the practicability of this machine. Experience gained will lead to further improvements of the present model. Some of the operating advantages offered include:

1. Positive and natural digging action at every point in the bottom of the shaft.
2. The machine can be operated by two men only. It will scrape and clean up the shaft bottom.
3. The machine may be lowered into position and set up for mucking in a few minutes, and after completion of mucking operations it may be hoisted instantly from the shaft bottom away from damage by blasting.
4. In bad ground, the machine may be operated with timbers close to the bottom of the shaft by leaving out bottom dividers temporarily.
5. Mucking may proceed with 2 or 3 ft. of water in the shaft bottom, thus saving important man hours, particularly in shafts making a large amount of water.

In construction of the machine every effort has been made to achieve simplicity in design and operation. Component parts are standard and available. If desired, the machine can be made at the mine machine shop to fit any shaft section.

I wish to thank W. H. H. Cranmer, president of the New Park Mining Co. for the privilege of witnessing the operation of this mucking machine, and for permission to report this description.

Spruce Pine's newest plant is of steel and concrete, with new and up-to-date equipment, and is designed to reduce manual labor to a minimum.



1. MICA IS CHARGED by barrows into hoppers of grinding mills. Motor drives and hoppers of two mills are seen. In the foreground are two new rollers for one of the mills.

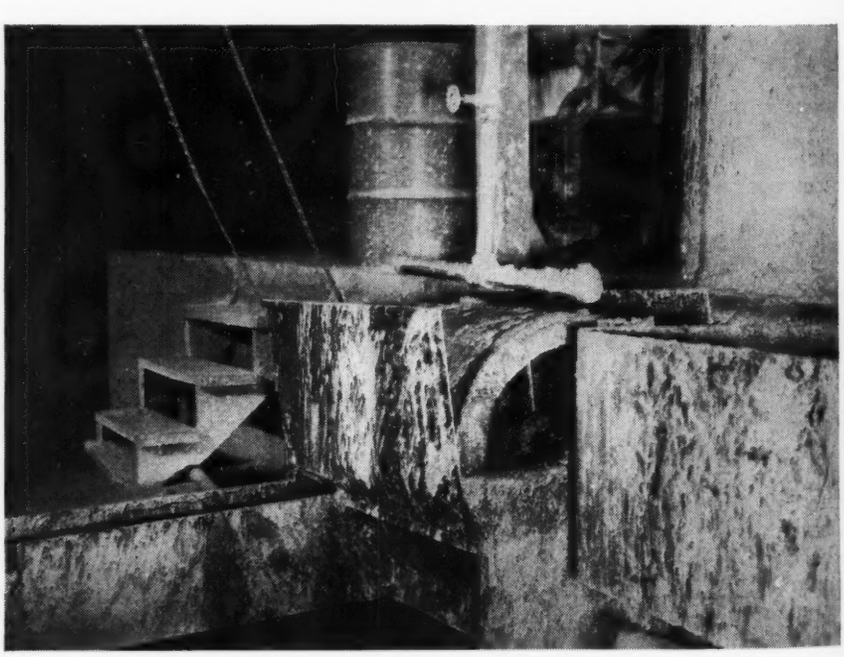
Modernizing the Production

WATER-GROUND MICA is now being produced by Diamond Mica Co. in its new and modern plant at Spruce Pine in western North Carolina. The company was organized in 1946 by R. T. Dent, J. T. Brown and J. B. McCoy to process scrap mica from local mines and manufacture products suitable for the paint, wall-paper, rubber and plastics industries. Only the highest grades of scrap mica from local sources are being used. Products include all of the various grades of wet-ground muscovite mica made to conform to specifications of the customer for his particular requirements. Engineering, design and construction of buildings and equipment have been handled by Mr. Dent and Mr. Brown, and are the result of Mr. Dent's long experience in mica manufacture.

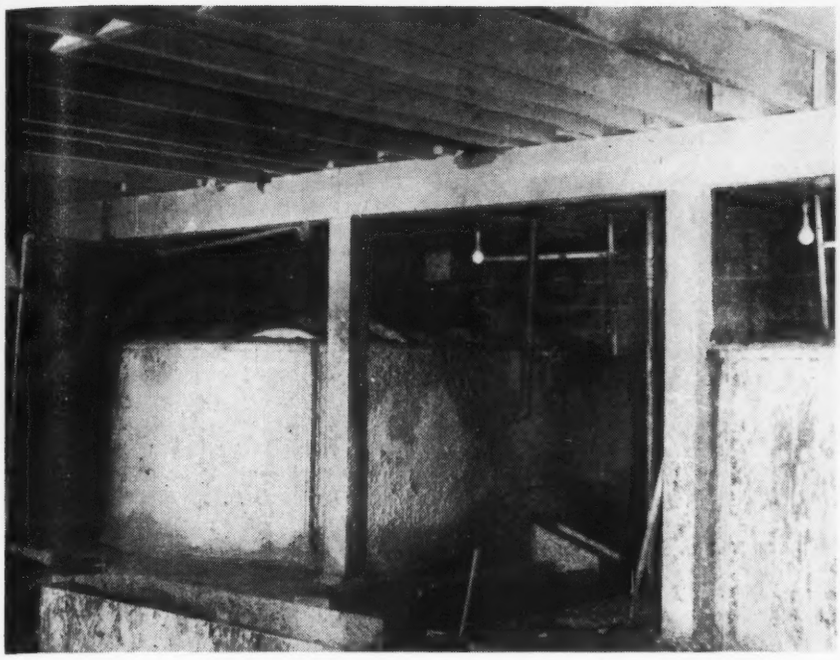
A Modern Plant

The main building, 95x110 ft. in dimensions, is constructed of concrete and steel, with concrete-block side walls and metal roof. Only the posts, roof rafters and a floor over the grinders are of wood. Side walls are so built as to permit removal in sections and allow for easy expansion and installation of additional equipment when needed. The substantial character of all construction reflects the company's faith in the future of the Spruce Pine region as a source of mica and is in keeping with that of other new plants in the area for processing non-metallic minerals, such as china clay and feldspar. The plant is set on a six-acre tract on the Clinchfield Railroad about a mile from the center of Spruce Pine.

A sloping site makes it possible to take advantage of gravity flow in the process used for preparing the mica. The equipment is mounted on six levels, the lowest of which is 30 ft. below the uppermost level.



3. TRASH is screened out of ground mica by the small trommel (center) between box at right previously mentioned and launder at left leading to the settling tanks.

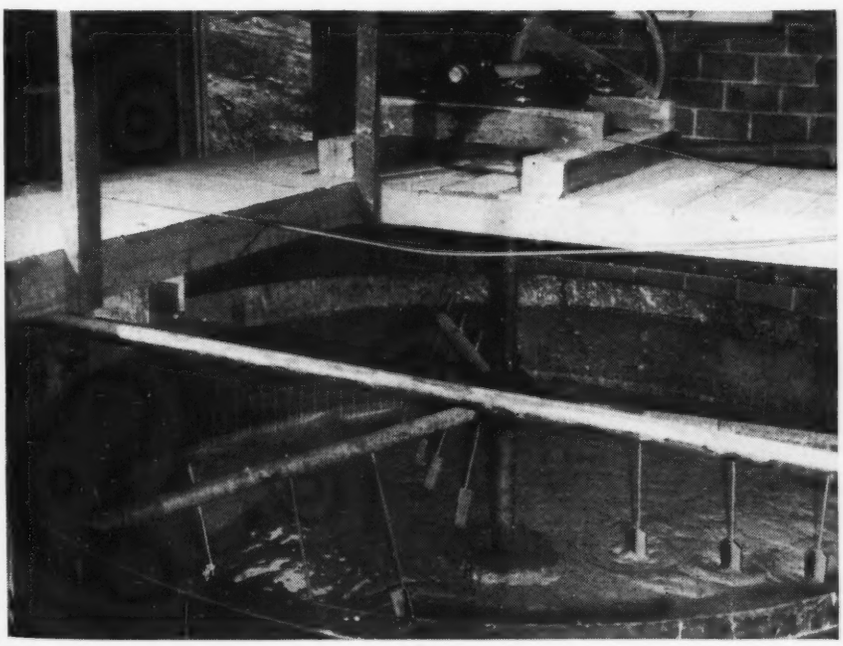


2. CHASER MILLS grind the mica in batches. It is then discharged into trough-like box (foreground) to let coarse mica settle.

R. T. DENT

# of Wet-Ground Mica

Trucks deliver the scrap mica at the top level, dumping directly into large covered storage bins, divided so that different kinds of raw material can be kept separate and later blended in grinding to produce uniform finished materials. Scrap mica ranges in size from ½-in. to 12-in. irregular blocks. The large blocks must be broken down before being charged into the grinders. From the bins the scrap is moved by barrows to steel hoppers over each grinder, each hopper holding a full charge for one batch of grinding.



4. SETTLING is done in one of five tanks, taking 24 hr. After surplus water is removed, agitator blades stir up the mica and it is run to the sump.

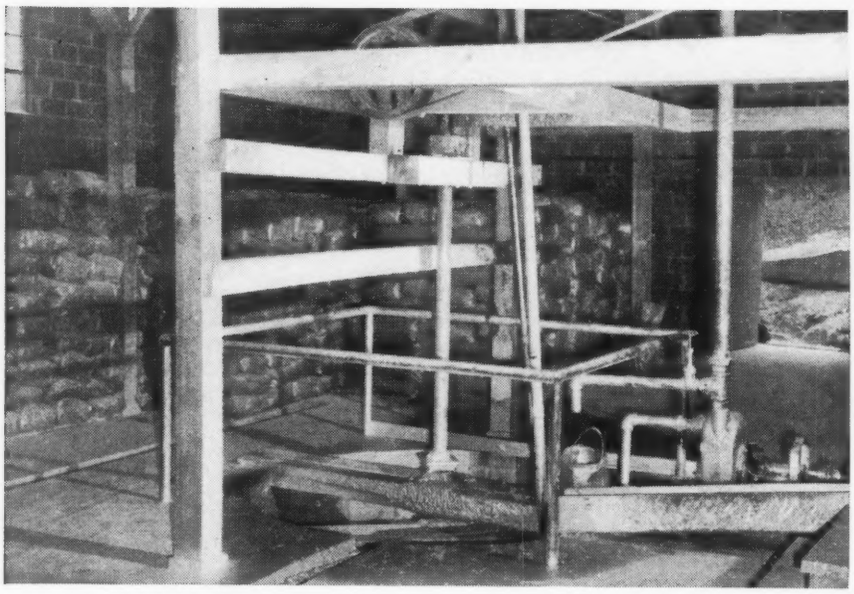
Mica Grinding

Water-grinding of mica is a batch process and is done here in 10 ft. diameter chaser-type mills having wooden mullers that roll on a wooden bottom. Wet grinding by wood on wood preserves the natural brilliance of the crude mica, which is essential to the finished product. Each batch is ground for six to eight hours depending upon the hardness of the scrap and the fineness desired. Thus each grinder is discharged three to four times each 24 hours.

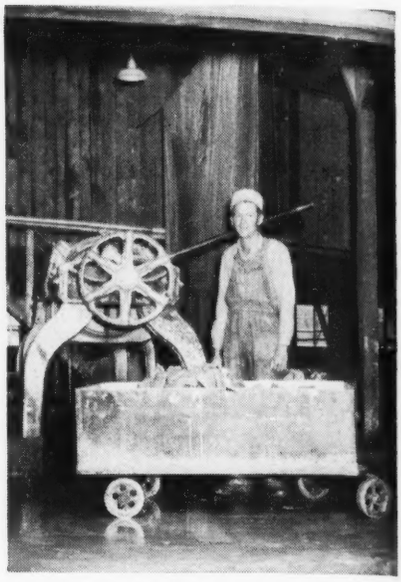
On being discharged, the batch is thinned with water and flows by gravity into large sediment traps where the coarser mica is captured and returned for re-grinding. That part of the batch which is sufficiently ground to make the finished products is water-floated to capture only the clean, fine mica particles. The flow is then wet screened on a 2x4-ft. trommel, covered with 20-mesh wire, which removes any floating undesirable, foreign matter; thence it goes to five steel tanks, each large enough to hold the discharge from several grinders.

Settling

Tank contents are allowed to settle for 24 hours, after which the water above the settled mica is

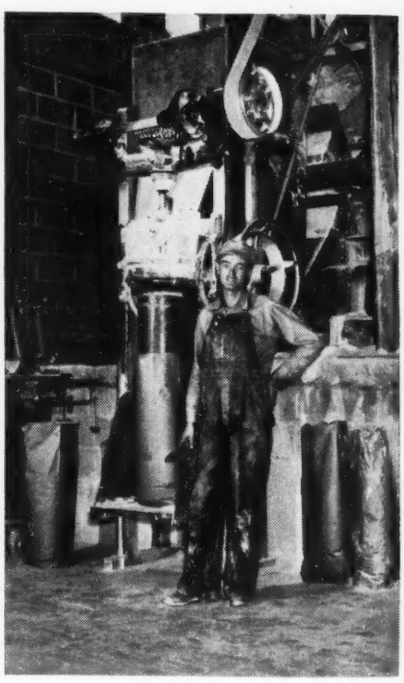


5. FROM THE SUMP on the bottom floor, or level, of mill the fine mica is pumped to the filter-press tank by an electric-motor-driven centrifugal pump. This is the only movement against gravity. Bagged mica is stored in the background.



6. FROM FILTER PRESS mica cakes go in car to one of the two steam-heated dryers. Moisture has been reduced to about 30%.

7. FROM THE DRYER (in the foreground) the dry mica is separated into two or three sizes on the vibrating screen above dry storage bin in background. A second dryer is out of picture to the right. Drying is a batch process, and requires 5 hours.



8. BAGGING is done on single-tube baggers, using 50-lb. and 100-lb. paper bags. Bagged mica is stored until shipment.

drawn off. The fine mica is then agitated with a rake mechanism to flowing consistency and is drawn off to a sump in the level below. An electric-motor-driven centrifugal pump carries the slurry from the sump to a high-pressure steel tank at the top level. This is one of the few movements against gravity in the plant.

Dewatering of the slurry is accomplished with an I-R compressor, the use of air pressure on the slurry forcing it into a 75-plate filter press. Filtering takes about 30 minutes and produces a cake with 30% moisture content.

Drying

Two large Bartlett & Snow steam-jacketed dryers are supplied with steam from a 60-hp. Erie City Economic boiler. Drying is a batch process and takes five hours. When dry, the fine mica is delivered to dust-tight steel bins and then elevated to a conical surge bin from where it is taken by a Syntron feeder to a double-deck Hum-mer screen where the various products are screened to specification. Bagging is done on a single-tube packer into 50 and 100-lb. containers.

In keeping with the current trend, mechanization has reduced the labor requirement in the plant to three men per shift. This is considered the irreducible minimum for this type of processing.

BEFORE renovation, old building was demolished; then new steel frame was set up. Mills never stopped rolling.

AFTER reconstruction, modern steel frame structure houses expanded, improved 3,000-ton lead-zinc milling plant.

Bunker Hill's New Mill

West Mill Rebuilt Without Interrupting Production

FRANK McKINLEY
Assistant Mill Superintendent
Bunker Hill & Sullivan Mining
and Concentrating Co.
Kellogg, Idaho

THE WEST MILL prior to remodeling had a capacity of 1,200 tons a day. Treatment of mine-run ore involved primary crushing to 1.25 in.; production of a jig concentrate; grinding jig middlings in rolls; and production of a lead concentrate and a zinc concentrate by fine grinding and flotation. In general, the design and construction of the plant followed the plans of Gelasio Caetani, who, in 1907, laid it out as a jig-table-vanner concentrator. The structure was properly maintained and alterations necessary to permit employment of modern practices were made from time to time, but the plant was not designed to meet present conditions.

Early in 1941 plans were being drawn for remodeling and modernizing the mill, the goal being a modern concentrator employing latest equipment and milling practices. The old wooden building was to be replaced by a steel and concrete structure. Shortly after preliminary work got under way, the United States entered the war and demand for metals increased.

To meet this requirement, the management decided to increase the capacity of the concentrator to 1,800 tons a day. This was accomplished in record time by construction and operation of a Sink-Float plant. Installation of this plant was the first step in the general plan of modernization. It was erected next to the original mill building.

Flowsheet Changed

As operation of jigs was no longer necessary or desirable, these units and the rolls in operation were removed from the section of the building housing them to permit construction of ball mill feed bins, an oversize bin for the sink product, and installation of a cone crusher to reduce the plus $\frac{5}{8}$-in. sink product to ball mill feed.

The next step was to remodel the grinding and flotation circuit and install suitable equipment. The original grinding circuit employed 6-ft. 22-in. Hardinge ball mills, and two 8-ft. 36-in. Hardinge ball mills. The two 8-ft. mills were relocated and three additional 8-ft. ball mills were installed after removal of the 6-ft. units The 8-ft. units were obtained from the South mill not in operation.

Next, additional flotation, thickening, and filtering equipment was installed. Resultant increased concentrate output required installation of new and larger lead and zinc concentrate storage facilities. The original wooden crushed ore bin was replaced on the same site with a steel and concrete unit of larger capacity. In carrying out these different changes, proper timing of each step was of utmost importance to avoid any interruption of milling operations. The job really amounted to building a new mill on the site of an old one with no loss of production.

After placing in operation the additional mill equipment mentioned, the picture prevailing was a modernized milling plant operating in a building of wood construction of ancient design, weakened

both by decay and, in places, by removal of structural parts to permit installation of equipment. The problem at this point was removal of the old wooden structure and replacing it with a modern steel structure without loss of operating time in a district with a relatively short summer season, and one favored with brief but severe summer rains.

The 350 tons of pre-fabricated steel for the building when received at the site was unloaded from the cars and placed in patterned groups. Steel erectors with crane and other appropriate equipment arrived, and the process of demolition of the old building and erection of the new steel structure began July 17, 1947.

Milling Is Uninterrupted

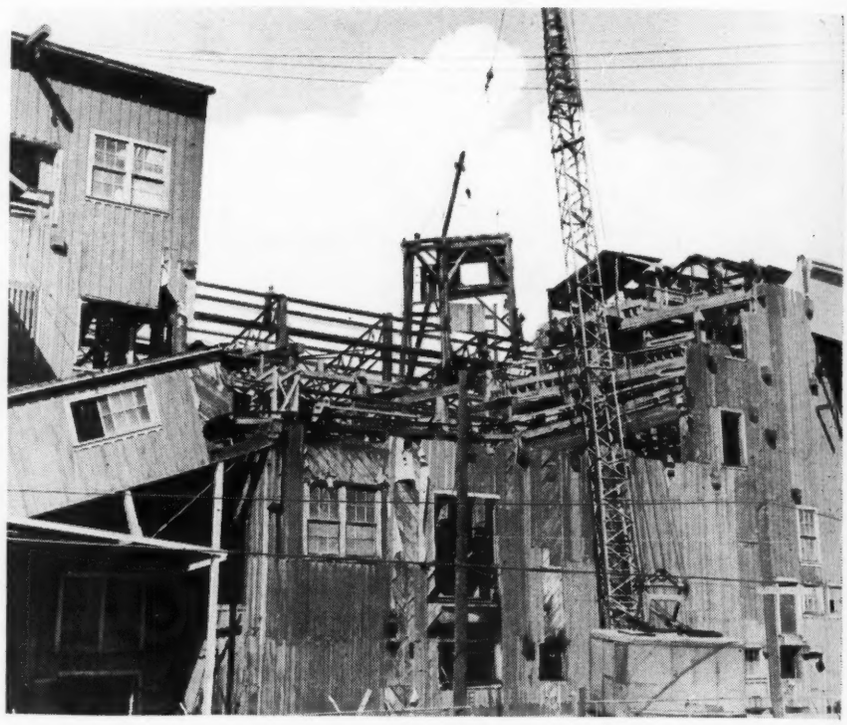
As the work was carried on while mill machinery was running, old wooden structures enclosing the ball mills had to be lifted by crane while the mills were in motion. Then steel columns and trusses were eased into position to serve as supporting for new sheeting and roofing. Staging and forges had to be erected in between ball mills, filters, etc. to enable riveters to assemble the structure.

Placing of the steel was completed September 7, 1947. Installation of the roof followed the erection of the steel work closely. Procedure was to put all hands to work covering the roof area completed after erection of each section of steel work. The roof proper consists of one 9/16-in. "Cemesto" board covered with one 45-lb. base sheet (sanded asbestos) and two 15-lb. cap sheets (fiber-rock asbestos) laid with hot tar and capped with cold roof coating.

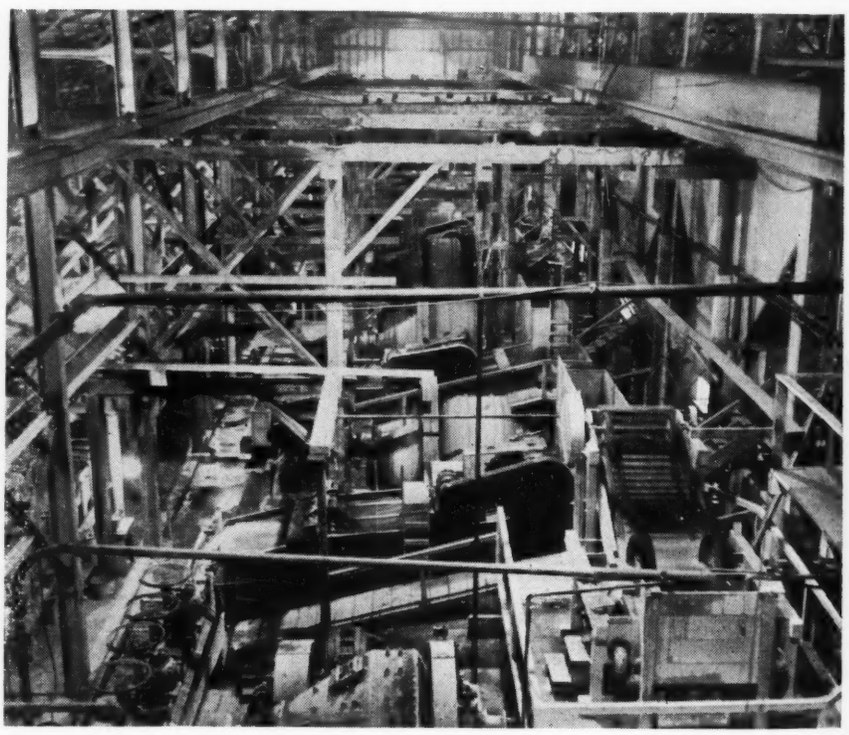
After completion of the roof, work was started on covering the walls of the steel building. The sheeting was placed on the walls and covered with tar paper, and stripped, pending coverage with 30-lb. felt paper and asbestos shingles during the coming summer season.

Shortly after completion of the reconstruction work described, the management decided to increase the capacity of the newly reconstructed concentrator another 1,200 tons, or from 1,800 to 3,000 tons a day. Necessary studies to carry out the task were undertaken, resulting in plans which call for the following changes in and additions to the present plant:

The first task will be enlargement of the Sink-Float plant. This is to be accomplished by installing more and larger screens to increase the primary screening area, as well as the area for the product screens, and a larger Sink-Float separator proper. These changes are to be made without interruption of current Sink-Float plant operations. The enlarged plant will be housed in the new concentrator building and will occupy the area made available where jigs and attendent equipment were located in the old plant. The capacity of the grinding section will be increased by replac-

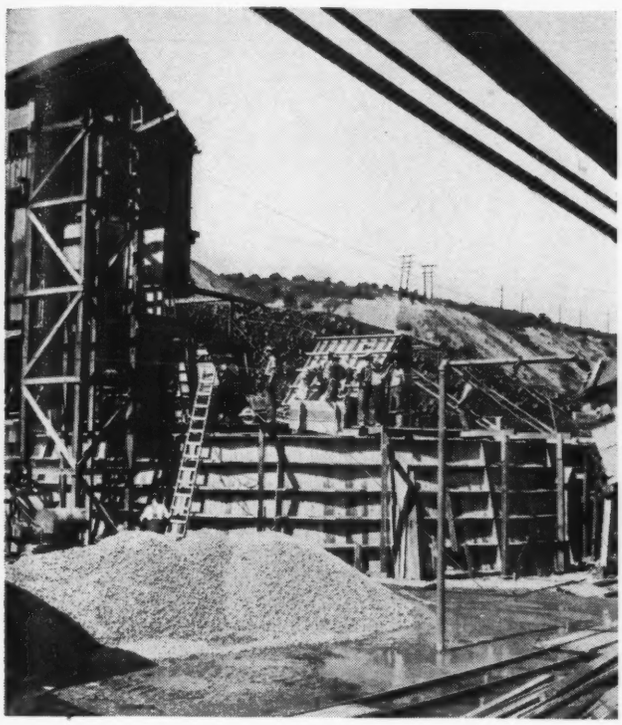


OUTSIDE the mill crane removes old timber framing. Note new steel over ball mill floor: Sink-Float feed conveyor is shown in the foreground.

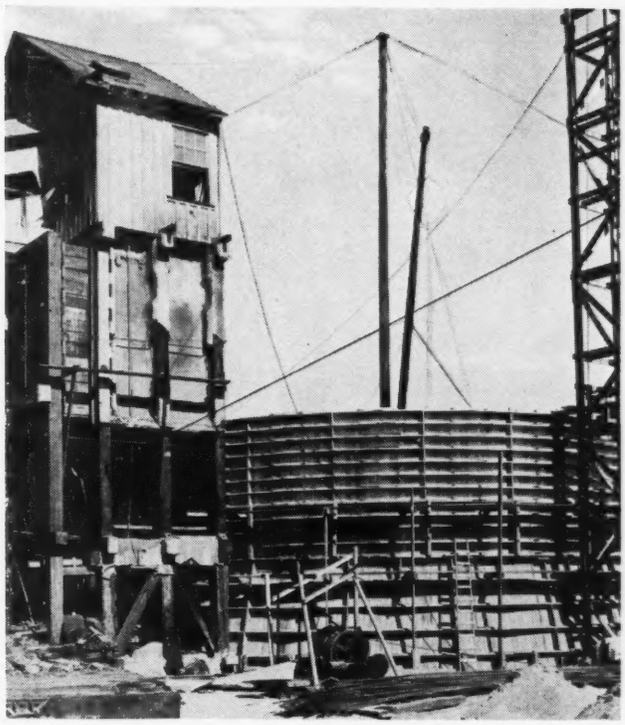


INSIDE the mill, steel columns mingle with old timbers yet to come out. Ball mill feed bins (right) take place once given to jigs.

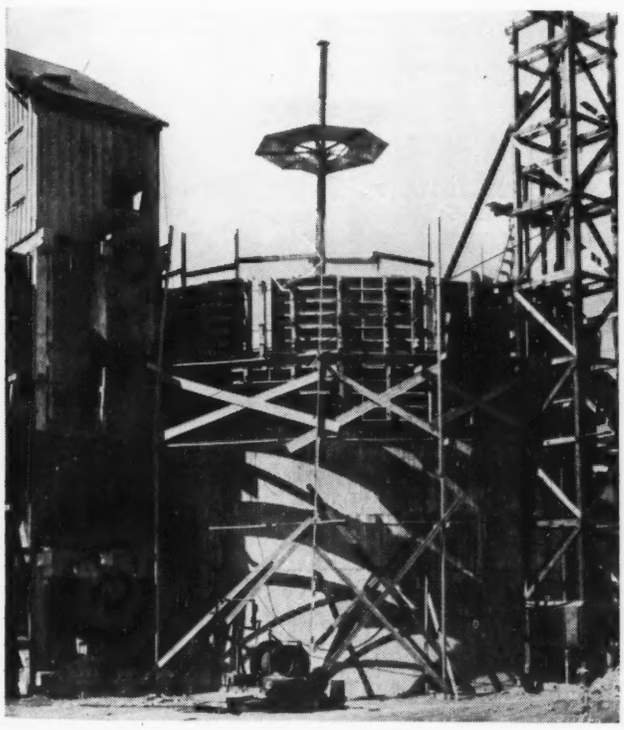
Four steps in building new ore storage bin



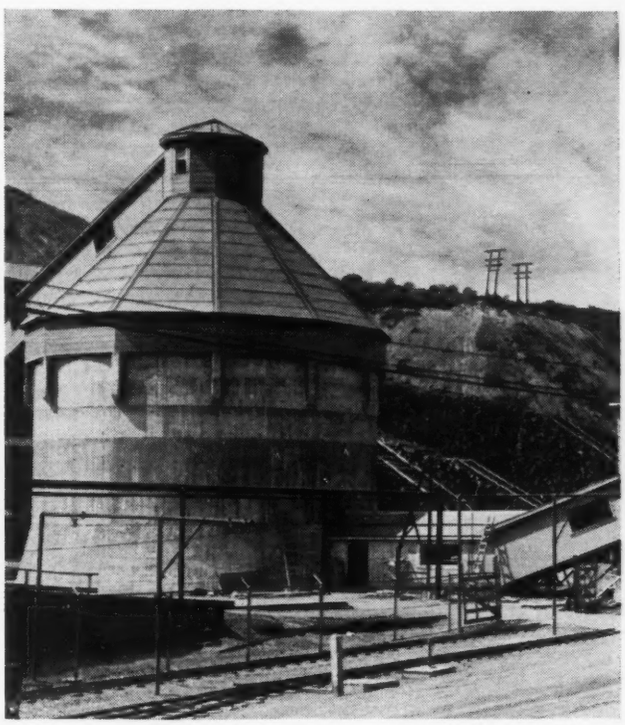
1. FORMS are up and concrete is being poured for base of new ore storage bin between mine and Sink-Float plant.



2. SECOND RING forms go up. Old wooden bin at left was used actively while new bin was under construction.



3. LAST RING forms go on. Note special forms for supporting columns and platform for starting roof structure.

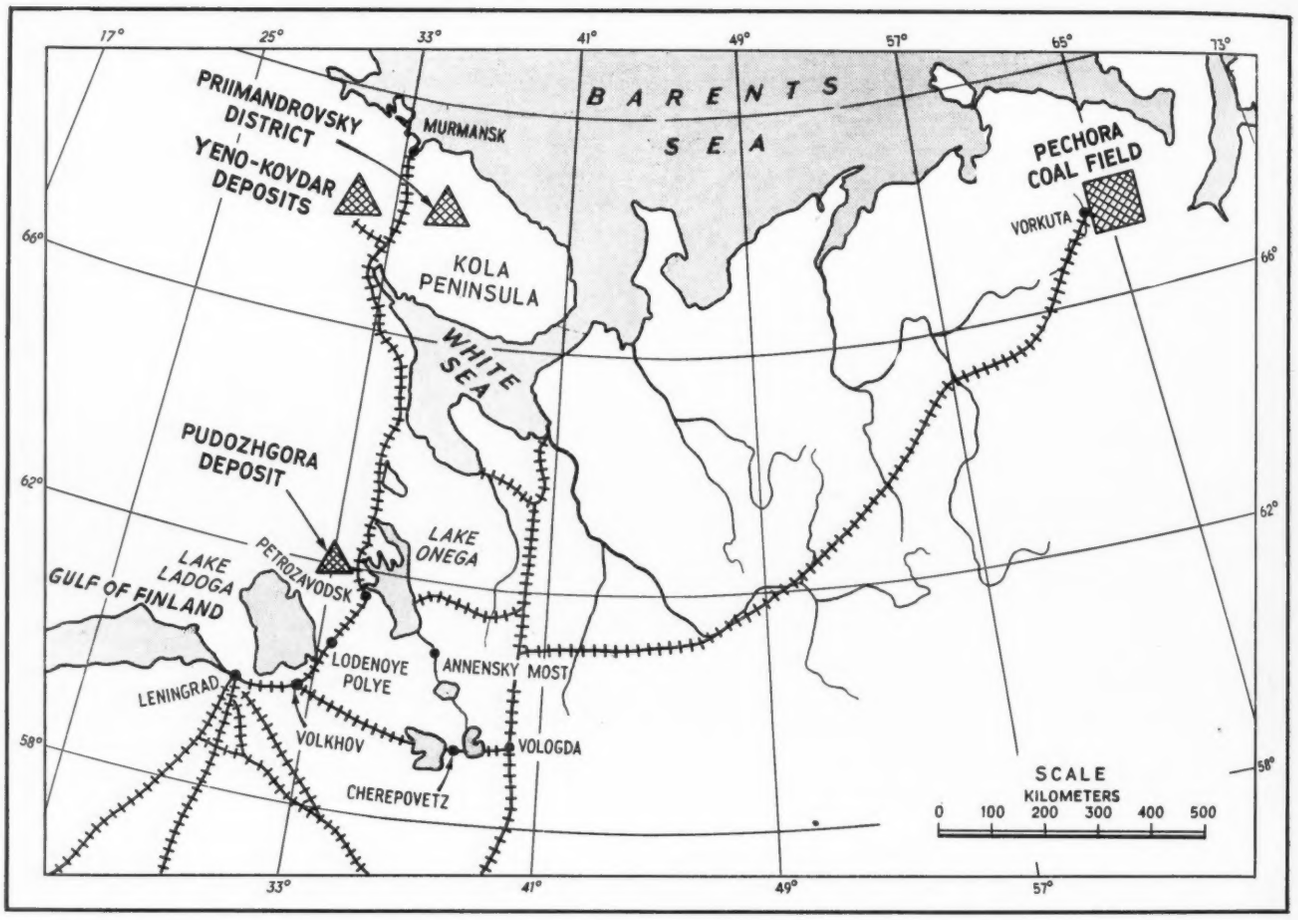


4. FINISHED BIN is one of several steps in modernizing West Mill, more than doubling its capacity.

ing two of the 8-ft. ball mills with 10½-ft. units to operate in closed circuit with corresponding large classifiers.

Required capacity of the flotation section will be provided by duplicating the current flotation rougher pattern. While thickening capacity has to be increased, as is true of some of the material handling machinery such as conveyors, pumps, and elevators, the remaining equipment is adequate. Construction of additional storage facilities for mine production ahead of the crushing plant is now in progress. The present crushing plant will be modernized and housed in a steel building following completion of the ore storage plant.

I wish to thank J. B. Haffner, general manager, and C. Y. Garber, mill superintendent, for permission to prepare this article.



STEEL for the Leningrad industrial area is goal of new Soviet plan. With blast furnaces at Cherepovetz, Lodenoye Polye or Annensky Most, east of Leningrad, iron ore must come from Kola peninsula, 900 miles away (triangles); coal, from Pechora (square) about 1,400 miles.

Soviet Union Builds Large

FINALLY FULFILLING a dream of Peter the Great — and a pet idea of Dictator Stalin, — the Soviet Union is building a large iron and steel center in the Leningrad region. The goal is to attain capacities of 4,000,000 to 4,500,000 tons per year of pig iron and 6,000,000 to 6,500,000 tons of steel by 1960. This will be approximately one-tenth of the total iron and steel capacity planned for the USSR by 1960.

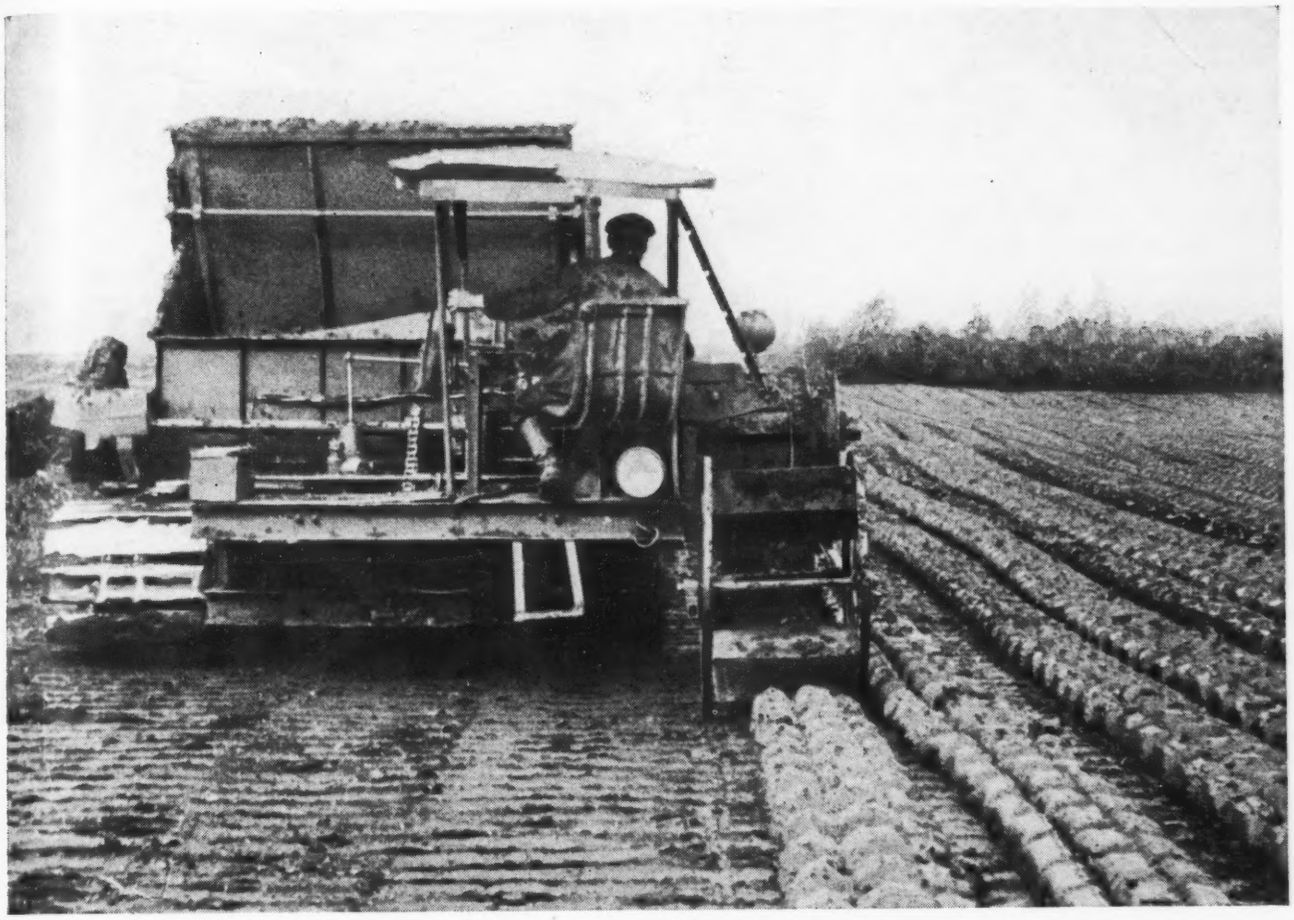
The project is designed to serve the important Leningrad manufacturing area more effectively, and no doubt to disperse essential production facilities in line with military strategy.

Although all plans and processes are not complete, construction is probably well under way, as the Politburo views attainment of the goals as urgent. As long as two years ago, the head of the State Planning Bureau stated that construction was "unfolding."

IVAN BARDIN, leading Soviet metallurgist and national hero, headed a complex of bureaus, institutes and scientists that devised plans for new steel industry near Leningrad.

Many Disadvantages

The project will be uneconomic in comparison to current costs of iron and steel in other countries. Thus, it would only be feasible in a controlled or highly protected economy, where the burden of high cost operations can be readily imposed on the consumers' standards of living. The iron ores are low-grade, and must be beneficiated under Arctic conditions after crushing to small size. Many of the available ore deposits contain interfering elements, such as sulphur, titanium, and phosphorus. The coal to be used is low-grade, averaging 18 per cent ash, and must be beneficiated also. To the most likely site, Cherepovetz, the iron ore must be hauled overland some 900 miles, and the coal 1400 miles. The planners hope to overcome these impressive handicaps by specially designed, high-capacity railroad cars, by the maximum use of local hydro



PEAT will be used to supplement Soviet high-ash coal. Burned in gas-generating plants, peat may help Soviets meet 1960 goal for Leningrad plant of 4,500,000 tons yearly of pig iron and 6,500,000 tons of steel. This machine digs peat, presses it into blocks.

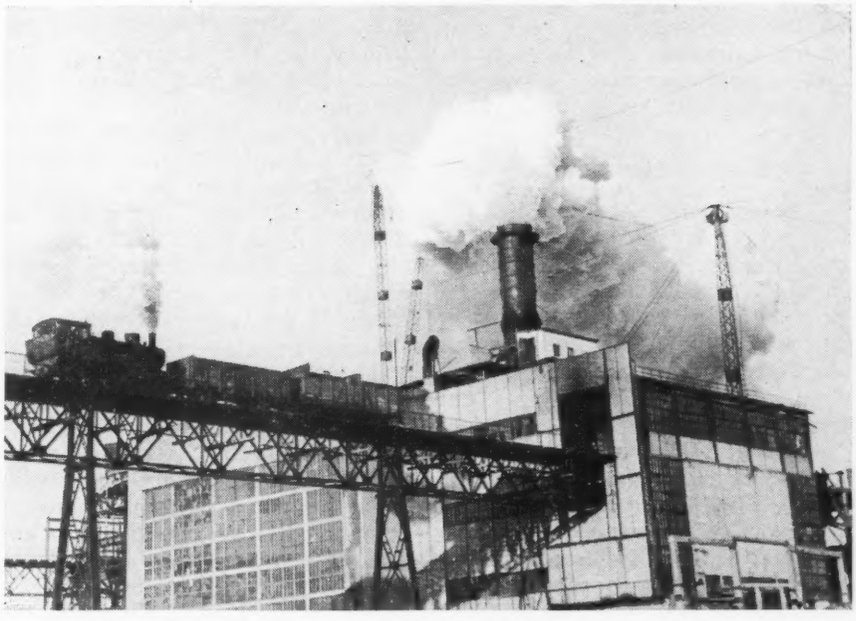
Northwestern Steel Center

power and peat, and by a generous use of scrap iron. Thus, the planners expect to furnish steel to the Leningrad area as cheaply as it can be brought from lower cost, but more distant, steel centers.

Bureaucratic Planning

Following the Soviet pattern, the plans are the product of investigations by the USSR Academy of Sciences, in charge of Academician Ivan Bardin, the country's leading metallurgist and a hero of Socialist Labor. Four branches of the Academy participated as well as nine other bureaus and institutes.

The first units to be completed will consist of two blast furnaces with a combined capacity of 1,200,000 tons per year of pig iron, open-hearth capacity of 2,000,000 to 2,220,000 tons, and a blooming mill of 1,600,000 tons capacity. These units are scheduled for completion by 1950. The complete project,



POWER PLANTS in Russia use a great deal of peat. In the Moscow region, for example, 23% of fuel for power stations is peat. This plant is the Dubrovskaya station near Leningrad, and the cars shown contain peat, of which Russians own half of the world's resources.

planned for operation by 1960, will contain two blooming mills, with capacities of 3,500,000 tons per year. There will also be plants for electric steels, rolling, forging, and heat treating.

Three Possible Sites

Three sites were being considered, all with a view to optimum transportation costs on ore, coal, and products, plus nearby power, flux, and refractory sources. The most likely location is Cherepovetz, where the Leningrad-Vologda railway crosses the Sheksna River, some 280 mi. east of Leningrad. Cherepovetz is favored because of the proximity of large peat deposits. There is also a nearby source of power at the Drozdov hydroelectric project (55,000 kw). The other possible sites are Annensky Most, on the Vytegra River 35 mi. south of Lake Onega, and Lodenoye Polye, 160 mi. northeast of Leningrad.

Partly because the Leningrad region is the nation's largest scrap-generating center, it is planned to charge the open hearth furnaces with 55 to 65 per cent scrap iron. Much of this material is now shipped to the Urals or Ukraine for treatment, with heavy transportation charges.

Anyone who has observed the low efficiency of Russian railroads will be amused at the planners' expectation of exceeding our performance in cost of rail transportation, through the elimination of interest and profit, by special large capacity railroad cars and by the use of other modern equipment. However, although the "real" cost of transportation may be high, in a controlled economy it is possible to come up with low figures.

Distant Fuel Source

The coal and coke supplies for the project are probably the most discouraging feature. This development is to have first call on the production of the Pechora basin, in the northern Urals, even though the Pechora area is only a few hundred miles from metallurgical centers in the Urals. This area now has about 20 mines, said to be worked chiefly by convict or forced labor. The principal deposits are those of Vorkuta. Opening of several new mines is contemplated, with the aim of raising production to 7,500,000 tons per year by 1950. Efficiency of the operations is poor, even for USSR, because of the severe climate and probably because of the use of a forced labor supply.

Because of the high ash content (18 per cent), Pechora coals must be beneficiated. It has been found possible to bring the ash down to eight per cent and make an excellent coking product. For this purpose wet treatment is required. However, because of freezing difficulties, it is planned to perform dry beneficiation before shipment, and finish up with wet methods at the destination.

The Pechora coal comes from several seams, all of which respond somewhat differently to treatment. Thus, blending will be necessary, in order to facilitate using central beneficiation plants and to produce a uniform product.

Because of the great distance from the Pechora coal basin to the new steel center – at least 1400 mi. – it is planned to use as much peat and hydroelectric power as possible, thus saving transportation costs. The peat will be used particularly for gas generation, a process on which the Russians have gained considerable experience. Already some 1,500,000 tons per year of peat are being mined, and one gas-generation plant uses 500,000 tons.

Low-Grade Ores

The iron ores on which the project will depend are chiefly in the far-north Kola Peninsula, secondarily in the Karelo-Finnish "Republic." The Kola Peninsula deposits are known to exceed one billion tons in magnitude, but virtually all the ores in both areas are low-grade, averaging 30-35 per cent iron. Thus, they will have to be beneficiated very substantially before suitable furnace feed is obtained.

The principal deposits of the Kola Peninsula are the Yeno-Kovdar deposits, about 50 mi. west of Zasheyek, on the Leningrad-Murmansk railway, and the Olenogorsk and Kirivogorsk (Priimandrovsky district) deposits, near Lake Imandra, 3-10 mi. east of Oleneya, on the same railway.

The Yeno-Kovdar deposits average 33 per cent iron, 2.7 per cent phosphorus and 0.08 per cent sulphur and are far from uniform in composition. There are wide variations in magnesia and titanium content. However, the Soviet scientists have worked out a tentative flowsheet that makes a 90 to 95 per cent recovery, raises iron content to 63 per cent and lowers phosphorus to 0.5 per cent. This is by crushing to 12mm., single-pass dry magnetic separation, grinding of middlings to −0.5mm., and two-stage wet magnetic separation. If the grinding is done to −0.2mm., the iron content is raised to 64 per cent and phosphorus lowered to 0.2 per cent. On the other hand, if grinding is done to only -3mm., the iron content drops to 58-60 per cent, phosphorus rises to 1-1.2 per cent and recovery drops to 90 per cent. The concentrate is agglomerated.

Because wet methods present difficulties in the severely cold Arctic climate, a dry alternative method has also been worked out, producing an 87 per cent recovery, 65 per cent iron and 0.26 per cent phosphorus.

An Alternative Flowsheet

Another alternative flowsheet, somewhat cheaper than the first, involves crushing to 25mm., subjecting the 6-25mm. material to dry magnetic separation (this traction needs no agglomeration), grinding the middling and the undersize to -0.5mm., and treating by two-stage wet magnetic separation, then agglomerating the concentrate.

The Olenogorsk ores average 35 per cent iron, 45 per cent silica, and are low in sulphur and phosphorus. These ores carry both magnetite and hematite, and are treated by a combination of magnetic and gravity methods yielding a 90 per cent recovery and 63 per cent iron. Concentration is by crushing to 2mm., treating by dry magnetic separation, and gravity methods, presumably tabling.

An alternative dry method of concentration employs crushing to 2mm., magnetic separation, grinding middlings to 0.4mm. and retreating magnetically. This yields an 80 per cent recovery and 60 per cent iron.

Tests on the Kirivogorsk ores were not reported. These ores are said to have a higher iron content and a greater proportion of magnetite than the Olenogorsk ores.

A Reserve for the Future

The deposits of the Karelo-Finnish "Republic" are regarded as a reserve for the future. Those now known are 90 per cent in the Pudozhgora district, along the west shore of Lake Onega. They are titaniferous magnetites, with iron contents ranging from 23 to 29 per cent. The best quality ores are titaniferous magnetites of the Belimeki district, which carry 30-45 per cent iron.

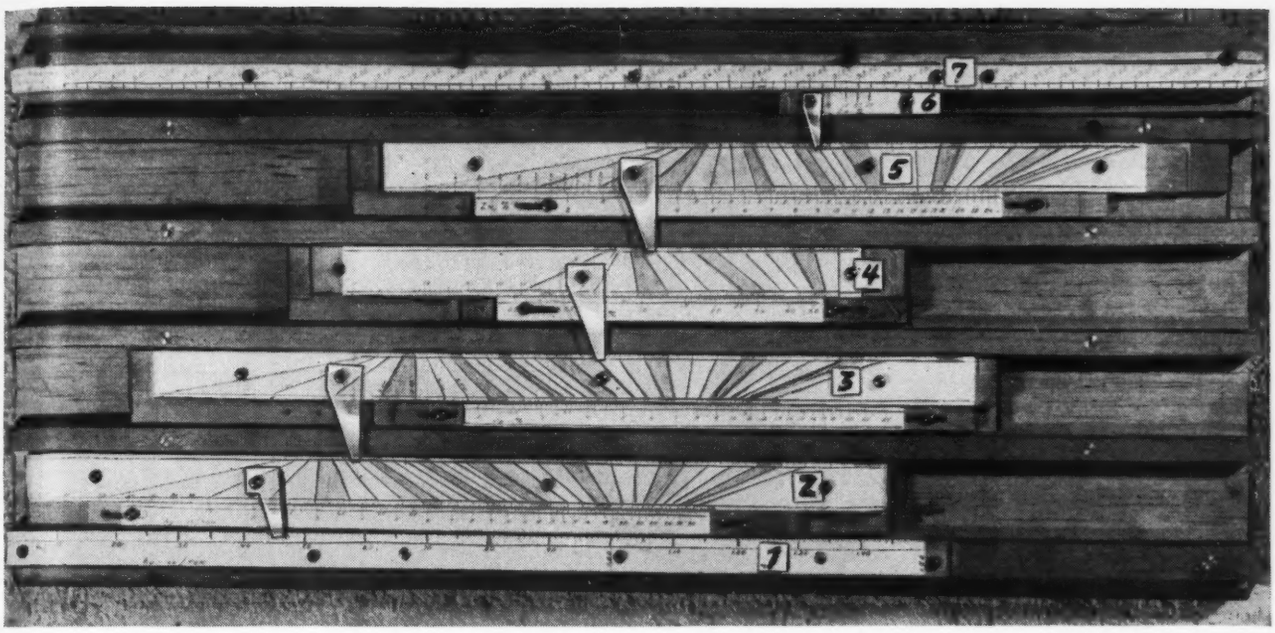


FIG. 1. Scales of slide rule are for: 1. Fixed gold scale. 2. Sliding silver scale. 3. Sliding lead scale. 4. Sliding copper scale. 5. Sliding zinc scale. 6. Second sliding zinc scale. 7. Fixed scale, graduated in dollars per ton net smelter return. Scales are covered with Plexiglas.

New Assay Slide Rule Computes Complex Ore Values

Ray E. Gilbert

Mine Geologist, New Park Mining Co., Park City, Utah

FACTORS TAKEN INTO ACCOUNT by the assay slide rule for determination of ore value now in use at the Mayflower mine of the New Park Mining Co. include variations in price of metal and grade of ore, and changes in smelter penalties and bonuses related to grade of ore.

In a simpler type of rule (E&MJ, April, 1947) assay values for each metal have been plotted on slides using a uniform scale to conform to dollar value. Here the total value per ton of ore represents the sum of the individual metal values. See Example 1.

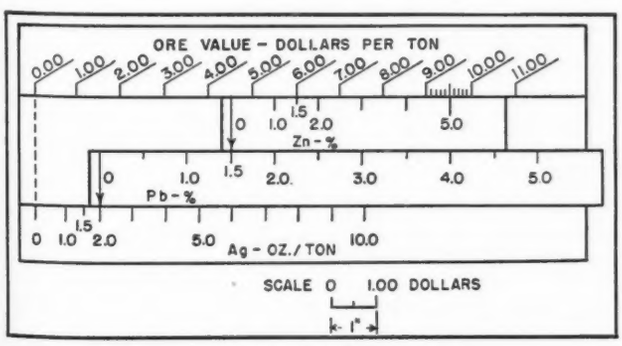


FIG. 2. Simple slide rule for silver-lead-zinc ore.

EXAMPLE No. 1. SIMPLE TYPE OF ASSAY RULE

Assume that a mine is paid 75c. per oz. for silver; 10c. per lb. for lead; 5c. per lb. for zinc. Make slides for each metal as shown. Each linear scale is so constructed that the distance from zero will measure the value in dollars which corresponds to various grades of ore expressed in percent or ounces. If metal prices change, new slides must be substituted.

As shown at left, the rule is set for an ore bearing 2 oz. silver, 1.5% lead, and 5% zinc. Total value per ton of $9.50 appears on the top scale. This rule can also be set to cover fixed treatment and freight charges per ton by shifting the top scale to the right. If these charges totaled $5, the top scale would be shifted 5 in.

With this type of slide rule, a new scale must be made every time the price of a metal changes. To avoid this, it is necessary to construct scales that can be adjusted to changing metal prices. The first step is to develop a formula for calculating the value of each metal taking into account all factors affecting the value received for a metal. These include the market price on which settlements are based; the percent of the market price paid for by the smelter; the percent of the metal paid for by the smelter, which generally increases as the grade of ore increases; any additional payment for higher grade ore, which will increase as the grade increases, but which may not vary with the market price; any penalties, which will vary with the grade; and the quantity of metal present in the ore, in ounces per ton or in percent.

GENERAL FORMULA

The following general formula for the value of a metal will hold for nearly any smelter contract:

$$v = PK_1g + K_2$$

where v = dollar value of the metal per ton of ore,
P = metal price on which settlements are based,
K_1 is a factor to correct for the percent of the market price and of the metal paid for by the smelter,
K_2 is a factor to correct for any bonus or penalty that may vary with the grade, but not with the market price,
g = metallic content, in ounces per ton or in percent.

EXAMPLE No. 2

A mine has the following hypothetical smelter contract for zinc: "Pay for 70% of the zinc at 50% of the East St. Louis price. For each percent zinc in excess of five, add 1% to the percentage paid for, but in no event shall the percentage paid for exceed 80%. Pay an additional quarter of a cent per pound for all zinc over 5%."

To fit this contract to the formula
$v = PK_1g + K_2$, let
P = East St. Louis price in dollars per unit (price in dollars per pound $\times$ 20),
g = zinc content of ore, in percent,
$K_1 = .50 \times .70 = .350$, up to 5% zinc,
$= .50 \times .71 = .335$, from 5 to 6% zinc,
$= .50 \times .72 = .360$, from 6 to 7% zinc,
and so on up to
$= .50 \times .80 = .400$, over 14% zinc,
K_2 (see last sentence of the smelter contract) is the bonus in dollars per unit multiplied by the number of units more than five, or
$K_2 = (.0025 \times 20) \times (g - 5) = .05\ (g - 5)$.
If the East St. Louis price is 10c. per pound, and the zinc content of the ore is 7%,
$P = .10 \times 20 = 2.0$; $g = 7.0$; $K_1 = .36$;
$K_2 = .05\ (7.0 - 5) = .10$;
$v = 2.0 \times .36 \times 7.0 + .10 = \$5.14$ per ton.

EXAMPLE No. 3

For most metals the K_2 factor will be zero, and the formula is simplified to: $v = PK_1g$.
This formula will work for a contract such as this: "Pay for 90% of the silver at the New York quotation."
The formula substitutions will be as follows:
P = New York silver price, in dollars per ounce; $K_1 = 0.90$;
g = ounces of silver per ton of ore.
The value of an ore containing 5 oz. of silver per ton, when the New York quotation is $0.80 per oz., will be:
$v = 0.80 \times 0.90 \times 5.0 = \$3.60$ per ton.

EXAMPLE No. 4

If there is a penalty on a constituent of the ore, the quantity PK_1g will be zero and the K_2 factor becomes negative. For a contract clause such as: "Charge $0.25 per unit for zinc,"
P and $K_1 = 0$; g = zinc content in percent; $K_2 = -0.25 \times g$.
The deduction for 5% zinc will be:
$v = -0.25 \times 5.0 = \$1.25$ per ton.

The smelter contract clause for each metal in an ore can be fitted to one of the three cases given in examples 2, 3, and 4. When the value v of a metal has been determined, it can be added to the other metal values by means of sliding scales, as described in Example No. 1. In order to do this, and at the same time have scales that are adjustable to changing metal prices, it is necessary to construct the scales in such a way that the entire general formula $v = PK_1g + K_2$ can be computed on the slides.

The theory can be more easily explained by considering the quantities PK_1g and K_2 separately, since separate slides must be made for each.

In the quantity PK_1g, all three factors are variables. P, the market price, varies independently of either K_1 or g, whereas for every given value of g there is a corresponding value of K_1 (Example No. 2). The value of the quantity PK_1g can then be considered as the product of the variable P and the variable quantity K_1g. The problem is to construct sliding scales that will give this value, when P and K_1g are known. This can be done by using the logarithmic scales of the ordinary slide rule. In other words, instead of the quantities being multiplied, their logarithms are added. This can be shown in equation form as follows:

$$\text{Let } v_1 = PK_1g = P \times (K_1g),$$
$$\text{then Log } v_1 = \text{Log } P + \text{Log } K_1g$$

This calculation would appear on a slide rule as shown in Fig. 3.

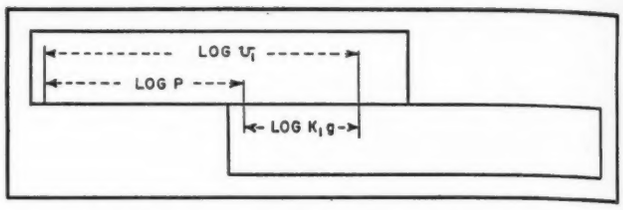


FIG. 3. Sliding scales arranged to add the logarithms of quantities P and K_1g to obtain the logarithm of their product, v_1.

EXAMPLE No. 5

Refer to Example No. 2, where $P = 2.0$, $g = 7.0$, and $K_1 = 0.36$. Then $v_1 = 2.0 \times (0.36 \times 7.0) = 2.0 \times 2.52 = 5.04$, or Log v_1 = Log 2.0 + Log 2.52 = Log 5.04.
This problem can be worked on the C and D scales of an ordinary slide rule by setting the index of the C scale at 2.0 on the D scale, then, opposite 2.52 on the C scale, reading the answer, 5.04, on the D scale.

Instead of the general logarithmic scales of the slide rule, special scales are constructed for the specific purpose of solving the PK_1g value of each metal. One scale will be in logarithms of dollars (this will be referred to as the logarithmic v_1 scale), the other will be in logarithms of the quantity K_1g (this will be referred to as the K_1g scale), and will be numbered in units of g.

EXAMPLE No. 6

To construct the logarithmic v_1 scale for the zinc contract given in Example No. 2, a logarithmic cycle of any convenient length is chosen. The length of the cycle will depend on the dollars-per-inch scale to be used on other slides, as described later. The cycle length should be such that the length of the logarithmic scale necessary to cover the desired range of dollar values is approximately the same as the length of the linear scale covering the same range. In this example, assume that a cycle length of seven inches is chosen. In other words, the distance from the logarithm of ten cents to the logarithm of one dollar, or from the logarithm of one dollar to the logarithm of ten dollars, will be seven inches. The divisions on a sheet of logarithmic graph paper are transferred by standard drafting methods from whatever cycle length the graph paper happens to have to the seven-inch cycle length,

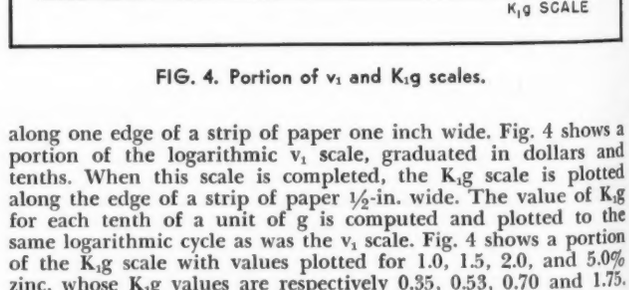


FIG. 4. Portion of v_1 and K_1g scales.

along one edge of a strip of paper one inch wide. Fig. 4 shows a portion of the logarithmic v_1 scale, graduated in dollars and tenths. When this scale is completed, the K_1g scale is plotted along the edge of a strip of paper ½-in. wide. The value of K_1g for each tenth of a unit of g is computed and plotted to the same logarithmic cycle as was the v_1 scale. Fig. 4 shows a portion of the K_1g scale with values plotted for 1.0, 1.5, 2.0, and 5.0% zinc, whose K_1g values are respectively 0.35, 0.53, 0.70 and 1.75. As shown in Fig. 4, one percent zinc, or its corresponding K_1g value of 0.35, is plotted the same distance from K_1g scale index as is $0.35 on the logarithmic v_1 scale plotted from its index. In practice, the values for each tenth of a percent zinc would be similarly plotted.

In Fig. 5, the logarithmic v_1 and K_1g scales are set for a zinc price of 10c. a pound. This is done by calculating the value of

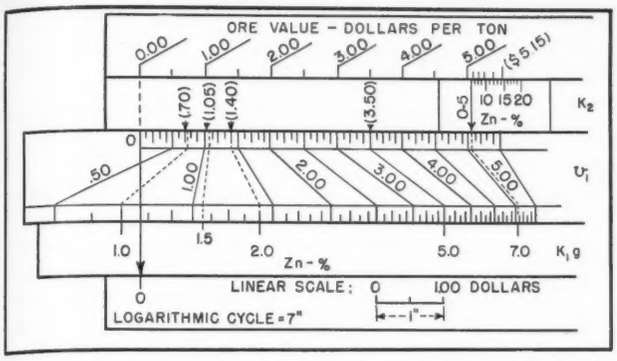


FIG. 5. Complete assembly K_1g, v_1, and K_2 zinc scales. The scales are set for 7% zinc giving a total zinc value of $5.15 per ton of ore.

the quantity PK_1g for one percent zinc from the formula $v = PK_1g$:

$$v_1 = 0.10 \times 20 \times 0.35 \times 1.0 = \$0.70.$$

The one percent mark on the K_1g scale is therefore set at $0.70 on the v_1 scale. As long as the two scales are in this relative position, opposite each g graduation can be read its corresponding v_1 value for zinc at 10c. per lb. When one percent zinc is set at $0.70, two percent is opposite $1.40, and five percent is opposite $3.50. If it is desired to set the scales for a different zinc price, the v_1 value for one percent zinc is calculated from the formula, and the K_1g scale is shifted so that the one percent division is opposite the new value.

To get the total zinc value in dollars per ton, it is necessary to add the v_1, or PK_1g, value obtained on the logarithmic scales to the K_2 quantity of the complete formula $v = PK_1g + K_2$. This can be done in the same way that values were added on the slides described in Example No. 1, but first the v_1 value must be transferred from its logarithmic scale to a linear scale. In other words, the logarithms of dollars were plotted on the logarithmic v_1 scale, and it is necessary to convert these values to a uniform dollars-per-inch scale similar to those in Example No. 1, before they can be added to other quantities. This is done by constructing a linear v_1 scale along the upper edge of the same strip of paper on which the logarithmic v_1 scale was plotted. The linear scale is so located that its central portion is directly opposite the central portion of the logarithmic scale. Lines at 50c. intervals extend from the logarithmic to the linear scale, to guide the eye rapidly from one to the other. Each 10c. division on one scale has a corresponding division on the other, so that the linear equivalent of any logarithmic value can be rapidly located on the linear scale. Fig. 5 shows a portion of the linear scale, plotted at a ratio of one dollar per inch, in position above the logarithmic scales, plotted on a 7-inch cycle. The dotted lines extending from the logarithmic to the linear scale show the paths taken by the operator's eyes in converting the logarithmic values of 1.0, 1.5, and 2.0 percent zinc to their respective linear values of $0.70, $1.05, and $1.40. The complete sliding unit for the quantity PK_1g consists of the three scales shown in the central part of Fig. 5 — the logarithmic K_1g and v_1 scales, and the linear v_1 scale.

A portion of the complete PK_1g unit for zinc on an actual assay slide rule is shown across the central part of Fig. 6. Note

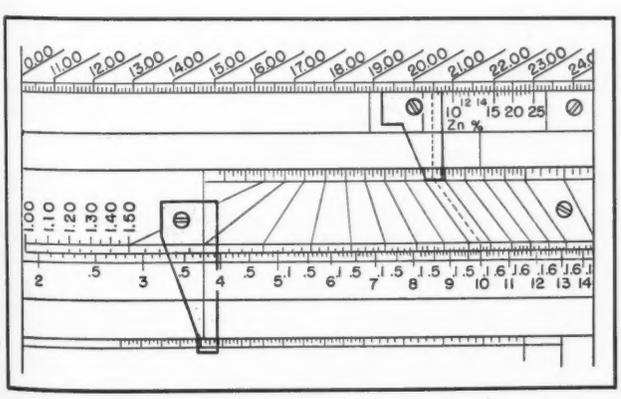


FIG. 6. Portion of the rule shown in Fig. 1. Two sliding zinc scales are shown and the fixed net smelter return on top. Slides are set for 10% zinc making a total value of $21 per ton for the ore.

that the pointer of the small zinc slide above it is set at the linear value of ten percent zinc.

A separate sliding unit must be made for the K_2 quantity in the zinc contract given in Example No. 2. Because the grade is the only variable in this quantity, $K_2 = .05\,(g-5)$, only a linear scale is needed. Values of K_2 are computed for each one percent change in g and plotted on a strip of paper at the same ratio of one dollar per inch as was used on the first zinc scale.

Fig. 5 shows how the dollar value of zinc would be found, by using these slides, if it were the only metal in the ore. The assembly is set for seven percent zinc, at 10c. per pound, the same problem as that given in Example No. 2. The index of the lower sliding unit is set at the zero point of the rule, the operator finds seven percent zinc on the lower logarithmic scale, notes its counterpart on the adjacent logarithmic dollar scale, locates its equivalent position on the linear dollar scale, and sets the index of the second zinc (K_2) slide at this position. Then, opposite seven percent on this slide, he reads the answer, $5.15 per ton (to the nearest five cents).

Fig. 6 shows how the zinc slides are used when other metals are present. The index of the lower zinc unit (across central part of the figure) has been set on the linear value of the preceding sliding unit (lower part of the figure), the index of the second zinc unit has been set at the linear value of ten percent zinc on the first unit, and opposite ten percent zinc on the second unit is read the total value of the ore, $21. per ton, on the scale across the upper part of the figure.

Zinc has been used as an example in the above illustrations because it is the only metal on the assay slide rule shown in Fig. 1 that has a K_2 value in the formula $v = PK_1g + K_2$, and therefore is the only metal requiring two sliding units. One sliding unit is all that is necessary for each of the other metals, since the total value of each can be found in the simplified formula $v = PK_1g$.

Mechanical Construction

A piece of one inch board, heavy plywood, or an old drawing board serves as a base for the assay slide rule.

Guides for the sliding units are made of ½x½-in. pieces of wood held in place by screws.

The K_1g and v scales are pasted on ¼-in. thick strips of wood somewhat longer and slightly wider than the scales. These strips are then mounted on another strip of wood, ⅜-in. thick, as long as the longest of the two ¼-in. strips, and slightly wider than the combined width of the two. By means of slots and round-head screws through the K_1g strip, its position relative to the logarithmic v scale can be changed as the metal price varies. An indicator is cut from a sheet of $^1/_{16}$-in. transparent plastic in a shape such that it can be screwed to the v scale and will extend across the separating guide to the linear v scale of the preceding metal. A reference line is scratched on the under side of this piece, and filled with black ink. The indicator is adjusted so that the reference line is at the zero point of the linear v scale, and is screwed down in this position.

When a metal has a K_2 scale, the scale is pasted to a strip of wood ⅝-in. thick, somewhat longer and slightly wider than the scale. A plastic indicator is made, and set as described for the other sliding units.

The scale on which the answer in dollars per ton is read is pasted to the last guide along the upper edge of the baseboard. This guide is ⅝-in. thick so that the scale is level with the sliding scales. This scale can be set to the right of the zero point of the slide rule so that the smelter treatment and freight charges would be added automatically and the answer obtained is the net smelter return.

The assay slide rule shown in Fig. 1 is 12x26-in. The linear scales are plotted at a ratio of $2 per in.

I wish to thank Mr. W. H. H. Cranmer, president and general manager of New Park Mining Co. for permission to write this article.

MARKETS—Trends and Prices

Tight Supply in Copper, Lead, and Zinc Continues—

Antimony Price Raised 2c.—Quicksilver Unsettled

THE TIGHT SITUATION in major nonferrous metals continued throughout May. Consumers were in the market for substantial tonnages of copper, lead, and zinc for June delivery, even though the approaching vacation period would tend to reduce consumption at numerous plants throughout the country. With no apparent change in policy in reference to this country's foreign program, operators in metals acted as if the civilian and military requirements for some time to come would absorb all of the offerings likely to come into the market. Surplus metals that fit into the strategic classification are expected to find a place in the Government's preparedness effort, as in stockpiling. Moreover, Europe's needs for basic products are large and are beginning to show steady improvement.

Producers were concerned over higher costs that have been incurred since the first of the year, and high-cost mines are questioning the ability of the stronger units in the industry to maintain prices at around current levels. The British authorities have again raised the price of tin. Wage agreements announced late in the month by General Motors attracted interest. Within the plan approved by management and labor, the wage adjustments granted under the latest formula are tied to the Bureau of Labor Statistics' cost-of-living index. Until the Government's fiscal policy moves away from its present inflationary course, prices, it is argued in market circles, are certain to remain strong where supplies are inadequate.

As May ended, prices for copper, lead, and zinc were quite firm. Outstanding in price revisions was an advance of 2c. per pound in antimony announced by the leading domestic smelter on May 22. This rise resulted from a shrinking supply of ore and continued heavy demands for the metal. Some sellers of antimony ore are now demanding up to $5 per unit of antimony contained. Both quicksilver and tungsten remained unsettled because of an easy supply-demand situation. The E. & M. J. index of nonferrous metal prices for May advanced slightly to 161.33, reflecting a higher monthly average for lead.

With some foreign consumers of copper actually paying a premium over the quotation prevailing in this country, the market naturally was a little concerned over the price outlook. However, bullish sentiment among speculatively inclined traders received a jolt when E. T. Stannard, president of Kennecott Copper, informed stockholders early in May that his company would oppose any increase in the price and declared that he sympathized with the action of the steel industry and other industries in their attempt to combat inflation. Demand for copper from domestic wire mills, he said, had been quite strong up to the beginning of March, but since then had receded somewhat. In regard to the brass mills, he pointed out that orders increased late last year but have tapered off.

Consumption of refined copper in the United States has averaged 119,991 tons a month in the first four months of 1948, based on statistics compiled for the fabricating division of the industry. This compares with consumption of 122,765 tons a month in the Jan.-April period of 1947. Stocks of refined copper in the hands of fabricators at the end of April totaled 407,752 tons, against 408,697 tons a month previous and 405,662 tons a year ago.

Deliveries of refined copper to domestic consumers in April totaled 116,475 tons, against 122,988 tons in March, according to Copper Institute. Deliveries of refined copper by members of the Institute to consumers situated outside of the United States amounted to 86,612 tons in April, against 69,127 tons in March. April deliveries to foreign consumers were the largest since November 1947, and reflected an easing in the supply of dollar exchange. The combined domestic and foreign copper statistics for March and April, in tons, are summarized as follows:

	March	April
Production, crude:		
Primary	183,434	178,594
Secondary	10,737	12,578
Totals	194,171	191,172
Production, refined	198,804	192,216
Deliveries, refined	192,115	203,087
Stocks, refined	226,914	217,428

Fluctuations in combined (world) stocks of refined copper have been inconsequential for some time past. Stocks in the hands of producers at the beginning of 1947 totaled 212,399 tons, increased to 220,014 tons at the end of the year, and now stand at 217,428 tons.

Lead Demands Heavy

Though consumers have been obtaining more lead since the beginning of this year than in the same period a year ago, there were no indications of a slackening in the demand. Uncertainty over the duration of the strike at Mexican lead properties, that ended late in the month under review, may have been a factor in the attitude of consumers to ask for more metal than tonnages actually available. Apparent consumption of primary and secondary lead in the first five months of 1948 probably averaged close to 95,000 tons a month.

It is too soon to appraise fully the

Production of Primary Aluminum in United States, 1943-1948

(Bureau of Mines)

In Tons

	1943	1944	1945	1946	1947	1948
January	60,650	84,750	48,650	24,750	50,045	48,767
February	55,600	74,400	45,650	22,250	47,002	45,699
March	64,600	80,200	53,100	26,000	53,032	51,874
April	66,800	77,800	51,600	25,900	51,007	.....
May	72,850	76,450	52,000	24,850	51,116	.....
June	74,150	66,400	47,500	27,800	46,259	.....
July	78,450	67,550	47,900	35,750	47,998	.....
August	81,350	61,650	45,800	39,850	47,054	.....
September	86,400	47,450	31,600	41,100	43,228	.....
October	94,050	48,400	25,000	45,000	43,959	.....
November	91,350	44,450	20,800	46,300	43,461	.....
December	93,600	46,850	24,000	50,700	47,589	.....
Totals	920,179	776,446	495,060	409,630	571,750	.....

Note: The monthly figures are largely preliminary and will not add to the totals shown in the table for the years 1943 to 1946, inclusive.

effect that the 17½c. price will exert on world production. Most observers agree that output will increase. Also, some consumers will conserve on the use of lead. In the first of a monthly series on use of lead in the United States, the Bureau of Mines estimates that January consumption of primary and secondary lead amounted to 92,793 tons, of which metal products absorbed 70,668 tons; pigments 11,072 tons; chemicals (tetraethyl, insecticides, etc.) 8,145 tons; and miscellaneous uses 2,908 tons.

The price situation in zinc was closely identified with the vacillating prospects for relief under the "incentive payments" plan about to be acted on by Congress. Tri-State producers of zinc concentrate maintain that without aid from the Government they will have to obtain a higher price in the open market. The price of zinc was strong, but ended the month unchanged at 12c. per pound for Prime Western, East St. Louis. Foreign buyers paid as high as 12¾c. for Prime Western and 13¾c. for Special High Grade, f.a.s. Gulf ports. Offerings of zinc were comparatively light.

Effective May 22, the import duty on antimony metal was reduced to 1c. per pound. On the same day the import duty in tungsten ore was lowered from 50c. per pound of W to 35c. Action on both items followed approval of the trade agreement by China.

Control on tin and antimony was extended until June 30, 1949.

In the first quarter of 1948 the United States consumed 10,000 flasks of quicksilver, the Bureau of Mines reports. Domestic production came to 5,300 flasks in this period, and general imports totaled 7,844 flasks.

Major Metals

U. S. DAILY AND AVERAGE PRICES

	Electrolytic Copper Domestic (a) Refinery	Electrolytic Copper Export (b) Refinery	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
1	No Market	21.425	94.000	17.500	17.300	12.000
3	21.200	21.600	94.000	17.500	17.300	12.000
4	21.200	21.550	94.000	17.500	17.300	12.000
5	21.200	21.425	94.000	17.500	17.300	12.000
6	21.200	21.600	94.000	17.500	17.300	12.000
7	21.200	21.600	94.000	17.500	17.300	12.000
8	No Market	21.425	94.000	17.500	17.300	12.000
10	21.200	21.425	94.000	17.500	17.300	12.000
11	21.200	21.500	94.000	17.500	17.300	12.000
12	21.200	21.675	94.000	17.500	17.300	12.000
13	21.200	21.600	94.000	17.500	17.300	12.000
14	21.200	21.625	94.000	17.500	17.300	12.000
15	No Market	21.550	94.000	17.500	17.300	12.000
17	21.200	21.500	94.000	17.500	17.300	12.000
18	21.200	21.650	94.000	17.500	17.300	12.000
19	21.200	21.525	94.000	17.500	17.300	12.000
20	21.200	21.600	94.000	17.500	17.300	12.000
21	21.200	21.625	94.000	17.500	17.300	12.000
22	No Market	21.625	94.000	17.500	17.300	12.000
24	21.200	21.575	94.000	17.500	17.300	12.000
25	21.200	21.925	94.000	17.500	17.300	12.000
26	21.200	21.425	94.000	17.500	17.300	12.000
27	21.200	21.650	94.000	17.500	17.300	12.000
28	21.200	21.450	94.000	17.500	17.300	12.000
29	No Market	21.425	94.000	17.500	17.300	12.000
31	Holiday	21.425	Holiday	Holiday	Holiday	Holiday
AVERAGES FOR MONTH						
May	21.200	21.554	94.000	17.500	17.300	12.000
AVERAGES FOR WEEK						
May						
5	21.200	21.517	94.000	17.500	17.300	12.000
12	21.200	21.538	94.000	17.500	17.300	12.000
19	21.200	21.575	94.000	17.500	17.300	12.000
26	21.200	21.629	94.000	17.500	17.300	12.000
CALENDAR WEEK AVERAGES						
May						
1	21.200	21.492	94.000	17.500	17.300	12.000
8	21.200	21.533	94.000	17.500	17.300	12.000
15	21.200	21.563	94.000	17.500	17.300	12.000
22	21.200	21.588	94.000	17.500	17.300	12.000
29	21.200	21.575	94.000	17.500	17.300	12.000

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

May 1948	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	(e)	(e)	(e)	(e)	$35.00
3	402.750	74.625	45.000d.	172s. 3d.	35.00
4	402.750	74.625	45.000d.	172s. 3d.	35.00
5	402.750	74.625	45.000d.	172s. 3d.	35.00
6	402.750	74.625	45.000d.	172s. 3d.	35.00
7	402.750	74.625	45.000d.	172s. 3d.	35.00
8	(e)	(e)	(e)	(e)	35.00
10	402.750	74.625	45.000d.	172s. 3d.	35.00
11	402.750	74.625	45.000d.	172s. 3d.	35.00
12	402.750	74.625	45.000d.	172s. 3d.	35.00
13	402.750	74.625	45.000d.	172s. 3d.	35.00
14	402.750	74.625	45.000d.	172s. 3d.	35.00
15	(e)	(e)	(e)	(e)	35.00
17	402.750	74.625	Holiday	Holiday	35.00
18	402.750	74.625	45.000d.	172s. 3d.	35.00
19	402.750	74.625	45.000d.	172s. 3d.	35.00
20	402.750	74.625	45.000d.	172s. 3d.	35.00
21	402.750	74.625	45.000d.	172s. 3d.	35.00
22	(e)	(e)	(e)	(e)	35.00
24	402.750	74.625	45.000d.	172s. 3d.	35.00
25	402.500	74.625	45.000d.	172s. 3d.	35.00
26	402.750	74.625	45.000d.	172s. 3d.	35.00
27	402.750	74.625	45.000d.	172s. 3d.	35.00
28	402.750	74.625	45.000d.	172s. 3d.	35.00
29	(e)	(e)	(e)	(e)	35.00
31	Holiday	Holiday	45.000d.	172s. 3d.	Holiday
AVERAGES FOR MONTH					
May	402.738	74.625	45.000d.	—	35.00
AVERAGES FOR WEEK					
May					
5	402.750	74.625	—	—	
12	402.750	74.625	—	—	
19	402.750	74.625	—	—	
26	402.700	74.625	—	—	

Calendar week averages, New York Silver: May 1st, 74.625; 8th, 74.625; 15th, 74.625; 22nd, 74.625; 29th, 74.625.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month; the premium on Special High Grade in most instances is 1¼c.

Quotations for lead are for common lead.

(c) Determined by Handy & Harman on the basis of market prices for bar silver, in cents per troy ounce .999 fine, in amounts of 50,000 oz. or more, nearby delivery, New York. Price quoted is in cents and one-eighth cent fractions and is usually about one-quarter cent below the market to allow for delivery, carrying, and marketing. In addition to foreign silver, the quotation also applies to domestic and Treasury silver if such silver enters into the market. The Treasury's purchase price of newly mined domestic silver 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

MARKETS — Trends and Prices

Miscellaneous Metals

(Monthly Averages)

Average prices of miscellaneous metals for April and May:

	April	May
Quicksilver, N. Y., flask	75.462	74.160
Antimony (a)	36.120	36.722
Antimony, bulk, Laredo	33.000	33.560
Antimony, in cases, Laredo	33.500	34.060
Antimony, Chinese (b)	....	....
Platinum, oz. troy	92.923	98.000
Cadmium (c)	175.000	175.000
Cadmium (d)	177.500	177.500
Cadmium (e)	180.000	180.000
Aluminum, ingot	15.000	15.000
Magnesium, ingot	20.500	20.500

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

E. & M. J. Weighted Index of Non-Ferrous Metal Prices

100 is composite for 1922-3-4. Copper Lead, Zinc, Tin, Silver, Nickel, Aluminum)

1938	73.67	1943	88.74
1939	77.71	1944	88.74
1940	79.22	1945	90.86
1941	83.49	1946	110.06
1942	86.80	1947	149.46

	1946	1947	1948
January	96.42	140.88	154.20
February	96.42	140.42	155.63
March	96.42	150.71	155.63
April	96.42	153.14	160.67
May	96.42	154.03	161.33
June	107.16	150.05	....
July	117.11	148.73	....
August	113.32	149.35	....
September	113.32	150.80	....
October	114.25	151.05	....
November	131.23	151.92	....
December	142.19	152.48	....

Official London Prices

Since Dec. 18, 1939, the British Ministry of Supply has named maximum delivered prices for the major non-ferrous metals. Prevailing delivered prices for consumers in the United Kingdom follow:

	Per £	Long s.	Ton d.
COPPER:			
Electrolytic, high conductivity	132	0	0
Fire refined, high conductivity	132	0	0
Fire refined, high grade	131	10	0
Fire refined, min. 99.2 percent	131	0	0
Fire refined, min. 99.7	130	10	0
Hot rolled black wire rods	138	0	0
LEAD:			
Soft, foreign, duty paid	90	0	0
Soft, Empire	90	0	0
English refined	91	10	0
ZINC:			
Foreign (G.o.b.), duty paid	75	0	0
Domestic (G.o.b.)	75	0	0
Prime Western and debased	75	0	0
Refined and electrolytic	75	15	0
Minimum 99.99 percent	77	5	0
TIN:			
Ingot, 99 percent	569	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

(May 31, 1948)

Aluminum, ingot, 99 plus percent, lb. (base price)	15c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	38.17c.
Bismuth, ton lots, lb.	$2.00
Cadmium, commercial sticks, lb.	$1.75
Calcium, lb. ton lots, 98 percent, cast	$1.95
Chromium, 97 percent grade, lb., spot	$1.02
Cobalt, 97 to 99 percent, per lb.	$1.65
Indium, troy oz.	$2.25
Nickel, electrolytic cathodes, lb., f.o.b. Port Colborne	33¾c.
Magnesium, 99.8 percent, carloads, lb., producer's plant	20½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$98.00
Quicksilver, flask of 76 lb., 25 flasks or more	$74.00
Selenium, 99.5 percent, lb.	$2.00
Silicon, minimum 97 percent, spot, carloads, lb.	14.75c.
Tellurium, lb.	$1.75 nom.
Thallium, 100 lb. or more, lb.	$15.00
Titanium, 96 to 98 percent, lb.	$6.00@$7.00

METALLIC ORES

Beryllium Ore, 10 to 12% BeO, f.o.b. mine, per unit	$16.00@$18.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
48% Cr_2O_3, 2.8 to 1 ratio	$34.00@$35.00
48% Cr_2O_3, 3 to 1 ratio	$38.00@$42.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range Bessemer	$6.60
Mesabi bessemer	$6.35
Old Range non-bessemer	$6.45
Mesabi, non-bessemer	$6.20
Lead, (Galena) 80 percent, Joplin, Mo., ton	$231.65
Manganese Ore—Per long ton unit of Mn, basis 48 per cent manganese, subject to premiums and penalties, f.o.b. cars Atlantic and Gulf ports, duty paid, 67.6@72.6c.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Foreign, 60 percent duty paid	$25.00@$27.50
Domestic, scheelite, 60 percent and upward	$30.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$78.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl., carload lots, delivered	6¼c.
Cobalt Oxide, 70 to 71 per cent, lb., ceramic grade	$1.27@$1.30
Copper Sulphate, 100 lb.	$7.60

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of contained Be	$20.50
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	18.60c.
Ferromanganese, 78 to 82 percent, gross ton	$145.00
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo, contained	95c.
Ferrosilicon, 50 percent, per lb. of contained Si	9.3c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$2.25
Ferrovanadium, per lb. of V delivered	$2.90
Silicomanganese, 1½ percent C, per lb. contracts	7.8c.
Spiegeleisen, per long ton, 19@21%	$52.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U.S. funds), ton:	
Crude No. 1	$896@$960
Crude No. 2	$350@$545
Spinning fibers	$204@$378
Paper stock	$51@$78
Shorts	$24@$46
Vermont, f.o.b. Hyde Park:	
Shingle stock	$97.00@$107.00
Paper stock	$68.50@$85.00
Waste	$51.00
Refuse or shorts	$25.50@$46.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$11.50@$12.00
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$9.00@$9.50
Bauxite, long ton:	
Domestic, crude, 50 to 52 percent (not dried)	$4.00@$5.00
Domestic, chemical, 55 to 58 percent	(a)$8.50@$9.00
Domestic, abrasive, 80 to 84 percent	$16.50
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, airfloated, bulk	$6.75@$8.00
Maryland, ball, bulk	$7.00@$9.00
Feldspar, bulk ton:	
Potash feldspar, 200 mesh	$17.00
Glass spar, white, 20 mesh	$11.75@$12.50
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 70 per cent, all rail movement, ton	$35.00
Acid 97.5 and 1 percent, bulk, ton	$42.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$27.00
Mica — Domestic f.o.b. mines. Punch 6 to 15c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 60 to 65c.; 2 x 2 inch, 95c. to $1; 2 x 3 inch, $1.35; 3 x 3 inch, $1.80; 3 x 4 inch, $2.25; 3 x 5 inch $3; 4 x 6 inch, $4; 6 x 8 inch, $6. Wet ground, very fine, $125 @ $155 per ton. Bulk sales, dry ground, $40@$80 per ton. Scrap, $30 and up.	
Ocher, Georgia, ton, in sacks	$24.00
Pyrites, Spanish, per long ton unit of S, cif. Atlantic ports	(a)12@14c.
Sulphur, Texas, mines, long ton	$16.00@$18.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50@$20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50

(a) Nominal.

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$39.00
Steel, base price, Pittsburgh billets, net ton	$45.00
Structural shapes, 100 lb.	$2.80

WASHINGTON REFLECTIONS

McGraw-Hill Washington News Bureau

Assessment Work May Be Suspended Again

The U. S. Department of the Interior has recently reminded holders of unpatented mining claims that "The act of May 3, 1943 (57 Stat. 74) which suspended annual assessment work on mining claims until the hour of 12 o'clock meridian on the first day of July after the cessation of hostilities in the recent war expired at 12 o'clock noon July 1, 1947, because of the proclamation of the President dated December 31, 1946. Therefore, all mining claimants in the United States, exclusive of Alaska, are required by law to do their assessment work before 12 o'clock noon July 1, 1948, in order to prevent relocation."

Bills suspending assessment work on mining claims in the United States and in Alaska have been reported favorably by the House Public Lands Committee and have been placed on the consent calendar. This means that the bills will come up for vote any time there is no more pressing matter, and probably will be passed along to the Senate late in the session. The Senate has already passed a bill suspending assessment work in the U. S. until July 1, 1948.

The House bill suspending assessment work in the United States, introduced by Representative Barrett of Wyoming, would hold off necessity of complying with the mining law until after July 1, 1948. The Alaskan suspension would be effective until July 1, 1949.

Pork Barrel Subsidy Bill Sponsored by House Group

A Presidential veto is waiting for the May 18 version of a new Russell bill (H. R. 6623) should the measure pass through Congress.

The legislation, intended to stimulate production of strategic and critical metals and minerals for military stockpiling, was, when rammed through the House Public Lands committee, a complete surprise to most observers in Washington.

Several groups of people interested in mining subsidies had made repeated attempts to write a bill which would be acceptable to the Administration, the industry, and to Congress. One attempt, drafted jointly by a group of operators and the Bureau of Mines, seemed, in early May, the most generally acceptable measure yet prepared. This measure, which would have established an individual-contract incentive plan (E&MJ, May, p. 105), was flatly rejected by the political group seeking amendments for the old Russell bill (H.R. 2455).

A few days later the politicians surprised observers by ramming a new bill through the Mines and Mining sub-committee of the Public Lands committee on a Saturday. This bill, later approved by the main committee, would establish conservation and development payments for all metals and minerals included on the Munitions Board's "A" list of stockpiling materials. Maximum payments, based on the highest market price plus highest premium paid during the war years, would be adjusted upward in proportion to the changes in the Bureau of Labor Statistics wholesale price index of all commodities. This would automatically raise the wartime ceilings on premiums by about 60% for most metals and minerals. Further adjustments would be made for every five-point increase in the index.

The development and conservation payments provided by the new bill, as adjusted by the BLS index, would have a ceiling of market-plus-premiums of: for copper, 36.6¢; lead, 20.39¢; zinc, 17.5¢; other metals and minerals not under a subsidy plan during the war, about 60% over OPA prices plus any bonuses, premiums or incentives paid by Reconstruction Finance Corporation or Treasury Procurement from 1942 to 1946.

Exploration payments would be made "in addition to development and conservation payments without regard to payment limitations provided in this act, and not in excess of a total maximum to be determined by the Director." The Administration doesn't like this clause, either.

The bill would set up a separate office in the Interior Department to administer the subsidies, with a $12,000 director, a $10,000 assistant director and "such other staff as he may deem necessary." However, the bill, although it sets maximum levels of payment, does not specifically state who should receive payments or prescribe a formula for determining payments. It neither grants nor denies the director power to determine some levels of payment below the maxima or to discriminate between beneficiaries. By leaving such an area of doubt, by implication the bill leaves complete discretionary power within the prescribed limits in the hands of the director.

The "raising by the bootstraps" arrangement would aggravate the Administration's biggest worry—inflation. Economic advisers to the President immediately labeled the Russell bill "inflationary".

For this, if for no other reason, the President will veto the measure should it ever reach him. The Administration argument is that the BLS index includes metal commodity prices. Any initial increase in these metals would be reflected in the index, and would result in a continuous "raising by the bootstraps" condition, the experts say.

The Presidential veto may not be necessary, however. The May 18 bill may never be allowed on the floor. Even before the latest version came out, Representative Charles A. Halleck of Indiana, majority leader of the House, had ruled that any such bill would have to be based on national defense needs and be approved by the Secretary of Defense. (E&MJ May, p. 105). From May 18 on, repeated attempts to obtain Halleck's approval met with "the brush off." Should the measure be allowed on the floor, however, it would have a good chance of passage. The Senate is ready to pass it along to the White House. It could not be passed over a veto in either house, however. Representative Russell has stated that H.R. 6623 is "it or nothing."

Inasmuch as the new Russell bill would put all increased production resulting from the subsidy into the military stockpile, the following list of materials and tonnages shows the maximum that could be expected from any type of subsidy, incentive, or Federal aid program. Confidential Government estimates for amounts of copper, lead, and zinc which would result from a subsidy are considerably lower than the estimates shown here, however.

	Wartime Peak	Estimated 1948 Production	Possible Addition under Subsidy
Copper	1,090,818 ('43)	860,000	230,818
Lead	496,239 ('42)	405,000	91,239
Zinc	768,025 ('42)	575,000	193,025
Manganese (48%)	247,616	131,000	*116,616
Chromium ore	160,120	948	*159,172
Mercury	51,929 flasks	23,244 flasks	*28,685 flasks
Beryl	388	150	*238
Antimony	5,556	5,188	*368
Tungsten	7,233	1,924	5,309
Platinum	26,000 Oz.	12,000 Oz.	*14,000 Oz.

(* See notes below)

Manganese, according to Government experts, under a long-term plan with a 25% premium over the present market price, would not be benefited. A 50% premium over market, would push production back to the wartime

peak. Main problem is one of additional beneficiation plants.

Chromium ore production, according to the experts, would increase only with a 50% premium over present market, and then only with a five-year guarantee on the premium.

Mercury mines, at today's prices, are closing. In order to bring out the wartime peak production the current market price would have to be more than doubled. Military stockpilers can buy all they want at current prices from the cartel.

Beryl, with a 100% premium over current market, might be pushed to a production level greater than the war peak. With the 100% premium, Government experts estimate, about 500 tons of 12% BeO might result. Double or triple this might be achieved if a practical flotation method were developed and put into use.

Antimony production, at the present $33 market, is expected to increase by about 1,000 tons. This will come from deposits which have been inactive at lower prices. No premium is needed here, Government experts say.

Platinum production in 1947 came from one dredge in Alaska. Any increase would depend on increasing dredging operations in Alaska.

Commerce Has Plan for Mild Industry Controls

White House rejection of the National Security Resources Board's "stand-by" controls suggestions (E & MJ, May, p. 105) has brought out a new set of suggestions—this time by the Commerce Department.

Commerce favors a three-point program. First, reliance on the priority for military orders which has been written into pending draft legislation. Second, to ask Congress for authority to use spot priorities to meet health and welfare emergencies—a few tons of steel to complete a city water main, enough copper to repair an electric transmission system. Third, to refurbish the failing voluntary allocation system set up by Senator Taft's legislation of last January.

Reestablishment of the Taft voluntary allocations plan would call for one decided change—the elimination of Justice Department approval of anything tending towards monopolism.

The Commerce Department planners point out: "Any scheme to have industry combinations divvy up orders and distribute materials is essentially a cartel. We might as well recognize the facts of life and call a cartel a cartel."

With this basic reasoning in mind, the planners are readying suggestions which would have Congress amend the Taft Act to allow the Commerce Department to grant anti-trust waivers to broadly-drawn programs. This would leave considerable discretion to industry—with the Justice Department unable to say anything about it. Only safeguard would be that a Government man would sit in on deliberations.

Administration officials know that any out-and-out controls program proposed to Congress, as the President tried last fall, would fail before it got started. On the "cartel" idea the officials believe they have at least a 50-50 chance of Congressional approval.

Congress May Loosen Union Shop Restraints

In late May the union shop issue broke out in all three branches of Government in Washington.

1. In Congress, the Senate-House Committee watch-dogging the Taft-Hartley law held hearings on this question: Should the new labor law be amended to drop the rule that employees must first vote approval of a union shop before a union may seek one from management?

Agitation for dropping the union shop authorization polls came after the number of such elections requested began to bog down the National Labor Relations Board. Furthermore, the unions were winning 98% of them anyhow, by overwhelming majorities.

2. NLRB formally decided, by a split 3-2 vote, that it would not conduct union shop elections under the Taft-Hartley Act in 13 states which have outlawed the closed shop and its lesser forms, union shop and maintenance of membership. Chairman Paul M. Herzog, dissenting, thought the board should at least conduct elections in those states when employers consent to them.

Munitions Board May Subsidize Production

A major change in military stockpile procurement policy is in the offing. Stockpilers, worried by their inability to obtain enough metal, are talking of entering the subsidy field—something they have violently shied away from in the past.

Two things motivate the change. First, the Russell subsidy bill is almost certain of a veto, leaving the stockpilers without any "other than market" source of materials. Second, and highly important to the Administration, is the fact that heavy stockpile buying on the domestic market would tend to be inflationary.

The Munitions Board has asked for $360,000,000 cash with which to buy strategic metals and minerals. The President has asked Congress to add another $300,000,000 in contract authority.

The $300,000,000 contract authority, if granted by Congress, would be used by the Munitions Board to subsidize "higher than market buying." It would work like this, according to preliminary suggestions. The Munitions Board, on a Presidential directive, would enter into long-term negotiations with mineral producers. The Board would use the Bureau of Mines as an advisory agency in the contracts. Production resulting from the contracts would go directly into the stockpile.

Observers in Washington believe that even if the Munitions Board should use its contract authority to subsidize domestic producers of strategic minerals, the $360,000,000 cash (less $75,000,000 to pay off last year's obligations) would be used mainly for foreign buying. Any subsidy program would be tied to the clause in the Buy American Act calling for a 25% price preference to domestic producers, but the board would probably not exceed that figure if the needed materials are obtainable abroad.

Go-ahead on the subsidy idea depends upon the granting of the $300,000,000 contract authority by Congress and failure of the Russell bill. In the light of the muddled situation with regard to the Russell bill in late May (see story herewith), it appears that the Munitions Board's new idea may be the only answer to increased stockpiling.

NAM Urges Return to Gold to Spur Recovery Abroad

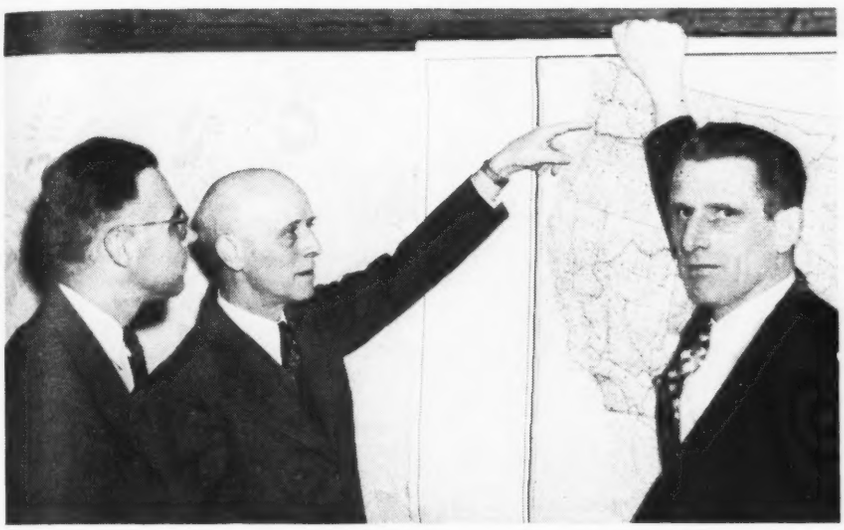
The National Association of Manufacturers has urged that the United States put its currency system on a gold basis to spur European recovery. Such a move would set a needed example to the rest of the world and encourage production in countries where people lack confidence in the present currency.

The association recommended the immediate removal of the discretionary power of the Secretary of the Treasury to buy gold at other than a statutory price; elimination of the requirement for a license to export gold; establishment of free convertibility of U. S. dollars into gold bullion, thereby returning the right of private ownership of gold in this country; and restoration of free convertibility of paper currency into gold coin.

Congress Suspends Lead and Scrap Duties

Congress has passed and sent to the White House bills suspending duties on lead and on ferrous and non-ferrous scrap. The Senate took action after considering favorable reports submitted by Government departments. H.R. 6489, by Knutson of Minnesota, would suspend duties on lead products until July 1, 1949. It applies to lead-bearing ores, flue dust, and mattes of all kinds, bullion or base bullion, pig and bar, dross, reclaimed and scrap, and antimonial scrap. It does not apply to lead alloys and fabricated articles. H. R. 6242 would continue until July 1, 1949, the present suspension of duties on scrap.

NEWS OF THE INDUSTRY



LESTER RICHARDS (R.), CHAIRMAN of Arrangements Committee for the Conference, assists Sheldon L. Glover (Cr.), Co-Chairman, in showing John R. Callaham (L.), Editor of *Chemical Engineering*, the location for the first Northwest Industrial Non-Metallic Minerals Conference, Portland, May 8.

Importance of Non-Metallics Is Stressed by Speakers at Northwest Minerals Session in Portland

The Northwest Industrial Minerals Conference, under the auspices of the Oregon Section of AIME with the Oregon State Department of Geology and Minerals Industries, the Portland Chamber of Commerce and Raw Materials Survey, Inc. as co-sponsors, met in Portland on May 8. Approximately 150 persons active in the mining and metallurgical industry, from all sections of the United States and parts of Canada, attended. The conference opened with an address of welcome from Gov. John H. Hall, who was presented by Eric Allen, Jr.

The growing importance of the industrial minerals industry to the West was stressed by Henry Mulryan, Western vice chairman, Industrial Minerals Division of AIME, and general manager of Sierra Talc and Clay Co., Los Angeles, in a luncheon address on Saturday. Examples of the unusual growth of the industry in the West were cited as the mining and processing of diatomaceous earth and the use of pumice and perlite in new forms of light-weight building construction.

John Dierdorff, vice president of Pacific Power and Light Co., Portland, principal speaker at the evening banquet, reviewed the growth of the Pacific Northwest and the parallel growth in power consumption. He stated that power from McNary Dam, now under construction, and the proposed natural gas pipeline from Alberta, Canada, to the Pacific Northwest will be a boon to domestic users and to industry.

Co-chairmen for the morning session were Fay W. Libbey, director, Oregon State Department of Geology and Mineral Industries, and Fay Bristol, Bristol Silica Co., representing AIME. The following papers were presented: "Rock Wool Manufacturing and Source of Materials in the Northwest," Dr. Vernon E. Scheid, head, Department of Geology, University of Idaho; "Sand Lime Brick," by E. R. Hannah, Washington Brick and Lime Co., Spokane, presented by R. F. Griffith; "Dantore—Its Origin, Development and Use," Fred D. Gustafson, Dantore Division, Dant and Russell, Inc., Portland; "Steilacoom Gravels," Stephen H. Green, mining engineer, and Marshall T. Huntting, geologist, Washington State Division of Mines and Geology.

General Thomas M. Robins, Portland consulting engineer representing the Raw Materials Survey and Portland Chamber of Commerce, and Sheldon L. Glover, supervisor, Washington State Division of Mines and Geology, were co-chairmen for the afternoon session. Papers presented were: "Industrial Mineral Flotation," James A. Barr, Jr., Applied Research Laboratories, Armour and Company, Chicago; "Industrial Minerals Research," Richard J. Anderson, Battelle Memorial Institute; and "Agricultural Diluents," Roy Miller, president, Miller Products Co., Portland.

Murray Calls Dissension Within MMSW "Grave"

Philip Murray, speaking at a convention of the steel workers' union in Boston in May, publicly disclosed the dissension which has been brewing for several months within Mine, Mill and Smelter Workers Union over failure to comply with the Taft-Hartley law. Murray said a "state of insurrection" exists within MMSW because of strikes being lost in the castings industry, and notice received by the union from major non-ferrous metal mining companies warning that they will not bargain with the union when current contracts expire unless union officers have filed non-Communist affidavits with NLRB. Pointing out that AFL and other CIO unions that have complied with Taft-Hartley are taking advantage of MMSW's predicament, Murray described the situation as "extremely grave."

Ken Eckert, director of MMSW Castings Division, asked Murray to give the castings workers "shelter" in some other CIO union but was told this could not be done. Until a few years ago the castings workers comprised a separate CIO affiliate called the National Association of Die Casting Workers.

AEC Increases Price for Uranium Bearing Ores

The U. S. Atomic Energy Commission announced early in May the following allowances, in addition to the previously established schedule (E&MJ, May, 1948), for delivery of carnotite-type or roscoelite-type uranium bearing ores in the Colorado Plateau area, to become effective June 1, 1948, and to be continued until July 1, 1949.

(1) A haulage allowance of 6c. per ton mile for transporting ore from the mine to the commission's purchase depot, with maximum haulage allowance of 100 miles. Distance from mine to purchase depot will be determined by the commission.

(2) An allowance of 50c. per lb. of uranium oxide (U_3O_8) contained in ores assaying 0.20% or more U_3O_8. This is in addition to the development allowance announced earlier.

The additional allowances resulted from a recent field survey by AEC of operating conditions in the Colorado Plateau area and conferences with independent miners and representatives of large companies. Production of the ores needed by the Commission will require the reopening and equipping of closed mines as well as increased production at active mines.

PRESENT AT THE FIRST INSPECTION of the Kelley shaft by Anaconda officials, immediately after the collar was set in place, were, left to right: A. C. Bigley, general superintendent of mines; R. H. Glover, western general counsel for Anaconda; Andrew R. Sims, mine superintendent; R. H. Toole, foreman; H. J. Rahilly, manager of mines, and E. S. McGlone, vice president in charge of Western operations of Anaconda. In the foreground are shaftmen William Peltomaa, left, and Rudolph Johnson.

Greater Butte Project Is Now Under Way

Current developments of the Greater Butte project were reviewed by Richard S. Newlin, assistant vice president, Anaconda Copper Mining Co., at a meeting of the New York Section, A.I.M.E., on April 29. In 1947 the company announced that the project would require the expenditure of 20 million dollars (E&MJ., Oct., 1947) during the next five years to develop and mine an orebody containing 130 million tons which will yield an average of 20 lb. of copper per ton.

Mr. Newlin reported that 20,848 ft. of exploratory openings on nine different horizons were driven to investigate this area during recent years. A 500-ton test section of the mill treated 111,760 tons of excavated material to determine possible recoveries. Two sections of the orebody have been undercut and mined by block caving methods, and a third section is now being tested by similar methods.

Preliminary work has started on the 9 x 38-ft., four-compartment Kelley shaft which will be lined with precast concrete slabs. Skip and manway compartments will measure 6 ft. 6 in. x 6 ft. 6 in., and the cage compartment will be 6 ft. 6 in. x 13 ft. 8 in. The cage will be large enough to carry a 10-ton mine locomotive or timber truck. Bottom-dump skips with 12-ton capacity will be used to hoist ore.

Main levels will be driven at 600-ft. intervals. Ore will be transferred to these levels by ore passes. Trains for haulage will consist of 20 5-ton, Granby-type cars and 10-ton trolley locomotives.

Certain zones in the area will be filled with wet tailings to be carried in by a pipeline now under construction. Mr. Newlin reported the following advantages for the use of tailings: (1) The fill is self-supporting and self-cementing and permits openings to be driven through it ahead of timber. (2) The fill will eliminate fire hazards. (3) The fill will have a cooling effect on the area, and (4) the fill will support ground in mining areas.

Mr. Newlin stated in conclusion that the Greater Butte Project would supplement present high-grade ore extraction and not replace it. It is expected that ore from the project will be mined at the rate of 15,000 tons per day by the end of 1951, and that this new development will extend the life of Butte operations by decades.

Pend Oreille Sells Shares and Plans Milling Plant

Pend Oreille Mines & Metals Co., has sold 700,000 shares of stock for $3,500,000 to Sullivan Mining Co. which already controlled about 5,000 acres of mineral ground in the Metaline area. The Pend Oreille company plans immediate construction of a new milling plant which will increase the capacity of the company to 1 million tons of ore a year, according to Lewis P. Larsen, president. The Sullivan, owned jointly by Bunker Hill & Sullivan Mining and Concentrating Co. and Hecla Mining Co., now owns about one-third interest in the Pend Oreille. The Pend Oreille plant now handles 750 tons a day while expansion plans are for handling 2,500 tons a day.

Pend Oreille Mines & Metals Co. has started to recondition its part of the Mead magnesium plant where experiments will be made with the reduction of zinc ores. Operation of a new adaptation of an electro-thermic process of treating zinc ores was expected to begin soon.

France Plans Expansion of Mineral Development

France is reportedly to be given a large portion of the Marshall Plan funds for relief, reconstruction and industrial development in France and in her colonial possessions. At present France is not in position to export any large tonnages of the mineral products needed in the United States. However, if, through Marshall Plan aid and private capital investment, the production of these products can be substantially increased, agreements may be made by which the United States is to get a portion of such increased output in part payment for the material and technical aid provided.

France issued a decree published in the Official Gazette on Feb. 3, 1948, which permits the conversion into dollars of dividends derived from dollar investment in Government approved projects. The French Government will agree to a scale of capital amortization to be determined in each individual case. This decree is to encourage the cooperation of foreign and local capital in industrial undertakings.

The French colonial ministry has prepared an extensive program for aid to the mining industries in the overseas possessions to be undertaken by the Federal agencies. This program includes the employment of a large number of geologists, topographers, and technicians to prepare topographic and geological maps in each of the colonies and to study possible improvements in present production methods, the application of modern large-scale operation for low grade deposits, as well as the problems of transportation and labor supply. It is anticipated that the major part of the funds required to carry out this program will be supplied by the Marshall Plan. This should result in building up the output of mineral products in which there is a world shortage and a reasonable amount of these products should be earmarked for shipment to the U. S. as part compensation for the Marshall Plan aid.

Copper Range Co. Reports White Pine Ore Reserves

Copper Range Co.'s report for the year described results of the exploration and development program at the White Pine property carried on through last July, at which time all exploration work was discontinued.

Though final calculations were not complete, Ira B. Joralemon reviewed preliminary estimates of tonnage and copper content as follows: developed ore, 94,200,000 tons, with 21.4 lb. copper per ton; probable ore, 105,410,000 tons, 23.0 lb. copper per ton; combined developed and probable ore, 199,610,000 tons, with 22.3 lb. copper per ton. In addition, assays indicate the orebody will average 0.20 oz. silver per ton.

Mineralization through this area is remarkable for its consistency and uniformity. The company feels that the orebody is of such a size as to make it one of the great potential sources of copper in the country. During the year the Freda Mill treated 34,141 tons of ore; metallurgical tests were carried on with the assistance of Battelle Memorial Institute. Overall results indicate that at least 86% of the copper can be recovered to produce a 16% copper concentrate.

Titanium Pigment Produced in Los Angeles County

A pilot plant for producing titanium pigment has been opened recently in the San Fernando Valley at Roscoe, operated by San Gabriel Pigments Co., according to a report from California Division of Mines. Utilizing locally produced titanium concentrates, the plant has capacity to process 3 tons of ilmenite concentrate with a minimum of 45% TiO_2 per day and will produce a white pigment of 30% TiO and 70% $CaSO_4$. Concentrates are digested in sulphuric acid and the resulting product is dissolved in water. Iron is crystallized out, hydrated lime added, and the clarified solution boiled to coprecipitate titanium hydrate and calcium sulphate. The precipitate is washed, then dried and calcined in one operation, the calcination taking place above 800°C. The titanium hydrate goes to titanium dioxide and the final calcined product is then pulverized to 325 mesh.

New Plant to Raise Alcoa Capacity 35,000 Tons

Plans have been completed for the erection of a $23-million plant to produce aluminum at Point Comfort, near Port Lavaca, between Houston and Corpus Christi, Texas, the Aluminum Company of America announced last week. The project, to be completed in about two years, will add 35,000 tons of capacity to the company's present annual potential of 325,000 tons of aluminum.

The installation will include a smelting or reduction plant with two potlines, facilities for producing carbon electrodes, and a power plant that will use natural gas for fuel to produce electrical energy.

Alumina will be shipped to Point Comfort from Mobile, Ala.

Cerro de Pasco Corporation Reports Activities in Peru

Frank F. Russell, president of Cerro de Pasco Copper Corporation, reported at the company's annual meeting that earnings in 1948 were expected to show an increase over the past year. Profits for the first quarter were less than a year ago because a copper furnace was down and only resumed operations in April.

Two-hundred tons of ore are being shipped daily from the Yauricocha copper mine in Peru, where a railroad and aerial tramway to the mine have been completed recently. This production was expected shortly to reach 350 tons a day. The Oroya copper refinery in Peru is nearing completion and should be operating around the end of the year. The company plans eventually to erect a zinc refinery, as zinc concentrates are now being shipped long distances for processing.

The company recently obtained a reduction in its Peruvian import and export tax rate. Officials hope to obtain some modification in exchange control regulations, which require the company to turn over a proportion of dollar sales to the Government of Peru at a fixed rate of exchange for Peruvian currency. Mr. Russell stated that Cerro de Pasco contributes approximately 12 to 15 million dollars annually to Peruvian dollar income, in addition to 2½ million paid in taxes to Peru last year.

Bradley Smelter to Treat Ores on Custom Basis

Officials of Bradley Mining Co. of San Francisco, Calif., plan to build a smelter at Stibnite, Idaho, for the reduction of the antimony and gold concentrates produced from their Yellow Pine mine. Construction is expected to begin this summer and the smelter should be in operation in the fall of 1949. The smelter, to be constructed by Western-Knapp Engineering Co., San Francisco, at a cost of over a million dollars, is being designed with sufficient capacity to treat on a custom basis antimony ores or concentrates produced in the Northwestern mining regions.

A flowsheet of the smelter follows: A 22-ft. multiple hearth roaster will calcine concentrates; the oxide from the roasting operation will be cooled and collected in bag house units and returned along with the oxides from the electric furnace, which has been similarly cooled and collected, to the reduction furnace with the calcine. A 2,000-KVA Pittsburgh Electromelt reduction furnace will be used for reducing the calcine; slag from this furnace will be granulated and then pumped to storage sites. The crude antimony bullion from the reduction furnace containing the gold and silver will be sent to two refining furnaces for arsenic and iron removal. The refined antimony bullion still containing the gold and silver will be transferred to two butane fired converters where the antimony will be blown by air, thereby producing antimony oxide to be collected in bag houses. The precious metals—gold and silver—remaining in the converters as a rich residue will be further refined to gold and silver bullion.

Company, Chilean Government Agree on Copper Expansion

Chile Exploration Co., subsidiary of Anaconda Copper Mining Co., has completed negotiations with the Chilean Government under which the company will spend $60 million over a 4-year period for new plants and other facilities to treat sulphide ore. Additional units to maintain or increase the output of copper at the Chuquicamata property will be added as the oxide ore diminishes and economic conditions warrant. The plans provide for the ultimate investment of $130 million to develop "the largest sulphide copper operation in the world."

Finance Minister Jorge Alessandri announced the agreement on May 20. Confirming the announcement, C. F. Kelley, chairman, and J. R. Hobbins, president, of Anaconda, said: "Briefly stated, the negotiations between officials of the Chilean Government and those of the company, which have been conducted over a period of several months in a spirit of cooperation and cordial understanding, have resulted in an agreement covering matters of importance in connection with the future investment of capital by the company in Chile. The assurances given involve exchange ratios between dollars and pesos, and rates of depreciation and amortization.

"The installation now contemplated, and which should be in operation by 1952, will supplement production from the present oxide plant. It will consist of a flotation concentrator and smelter capable of treating 25,000 tons of sulphide ore per day and will enable the property to maintain a production of 540 million lb. of copper per year."

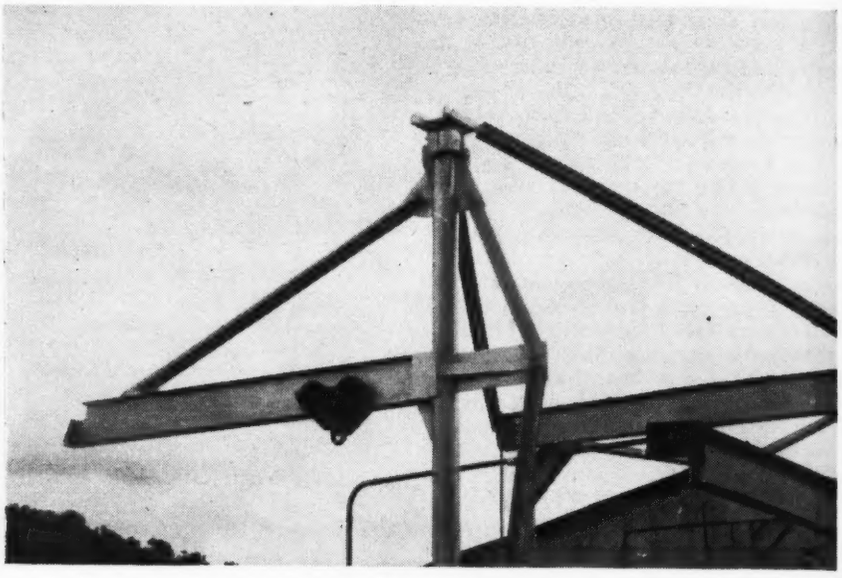
Oregon Railroad Lands Reopened to Entry

Two and one-half million acres of land in western Oregon known as the revested Oregon and California Railroad and reconveyed Coos Bay Wagon Road grant land have been reopened to exploration, location, entry, and disposition under general mining laws, under provision of the Ellsworth bill, H.R. 5049, which was signed by the President April 8.

Individual prospecting of these lands (called O and C lands) had been discouraged by an interpretation of the Department of Interior of an Act of

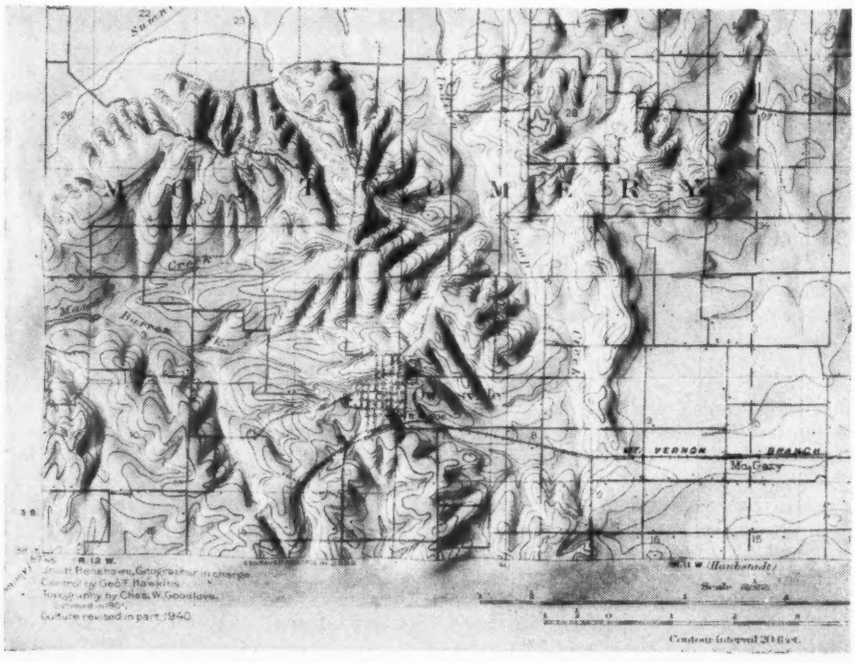
(Continued on Page 109)

OPERATING IDEAS



Bearing - Mounted Shop Crane

Heavy objects may be handled with ease with this bearing-mounted shop crane designed and built by Earl Snodgrass, master mechanic (right), St. Anthony Mining & Development Co., Ltd., Tiger, Ariz. Timken bearings from an old pillow block were used at top and bottom and account for the ease with which the crane can be rotated. The crane swings in a 360-deg. arc.



Plastic Relief Models

Thousands of light-weight plastic relief models such as the one here illustrated were used by the Armed Forces for training purposes. Today similar models are used as a teaching aid for engineering training and in other work where contour interpretation is necessary. Under the guidance of educators and the U. S. Geologic Survey, the Aero Service Corporation, Philadelphia, Pa., has prepared models for 12 quadrangles in the U. S. A.

The accompanying photograph of a plastic model was taken under a cross light to emphasize the relief that is shown at a glance by inspection of the model. Vertical exaggeration of the plastic model shown is 10 to 1.

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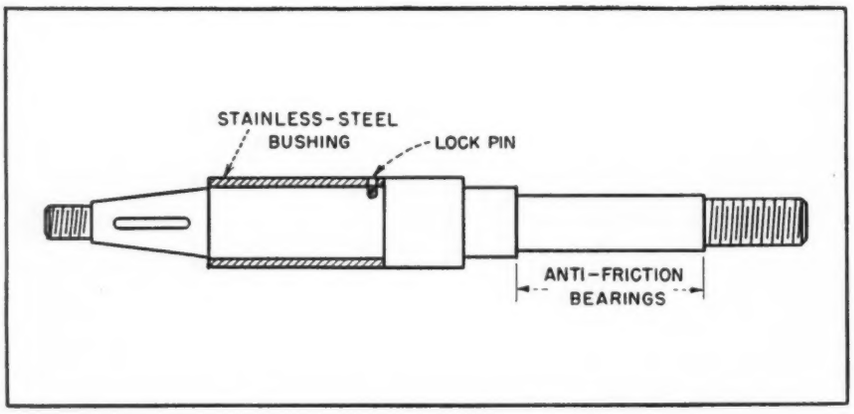


Shaft Sleeve Solves Pump Trouble

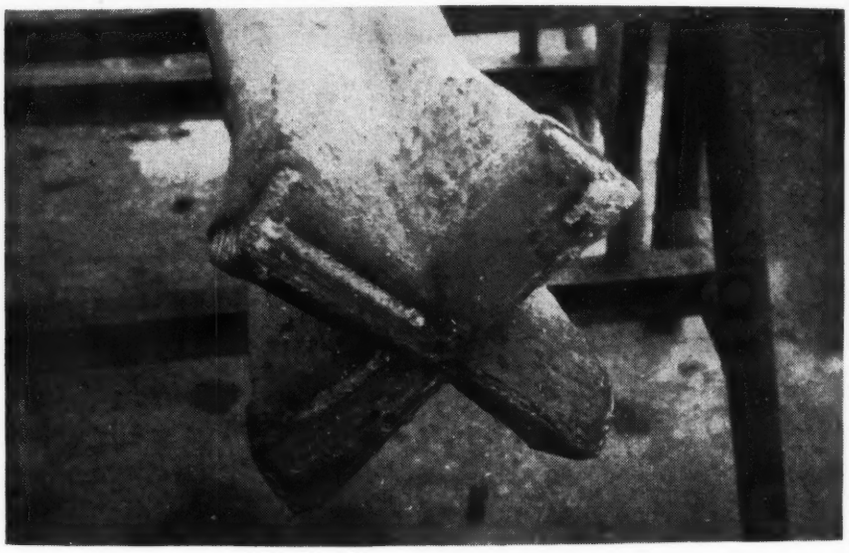
A stainless steel sleeve or bushing was installed on the impeller shaft of a centrifugal pump to withstand corrosive effects of a slightly acid mine water encountered at a Western copper mine as shown above. After a short period of operation, the original shaft became so badly worn in the stuffing box that water leaked through the packing and ruined the anti-friction bearings of the pump.

This condition was remedied by turning down ½ in. of the corroded part of the shaft, and installing a stainless steel bushing as shown here. The bushing was made slightly long so that when the impeller tightened against the shaft, it would press the bushing against its shoulders. As an extra precaution against turning, a ⅜-in. pin was placed as shown. Since completion of the repair more than two years ago, the only maintenance work required has been the replacement of the stainless steel bushing on the impeller shaft.

Hard-Facing Churn-Drill Bits

Churn-drill bits used in underground drilling operations at Saint Anthony Mining & Development Co., Ltd., are hard-faced with Stoody self-hardening rod as shown in the accompanying photograph submitted by Earl Snodgrass, master mechanic. For very hard ground Borium welding rods are used. Time required to dress one bit is about one hour.

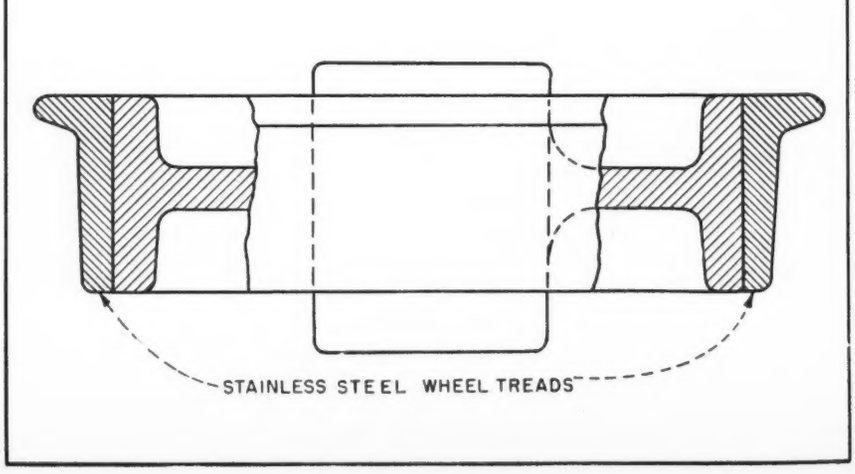
The chief advantage for hard-facing bits is that it is speedier and requires less handling of bits than conventional sharpening methods. The work is done in the machine shop, but it is quite possible to have the arc-welding equipment right at the drill site.



Hardfaced bits have drilled as much as 10 ft. in fresh granite, and 2 to 3 ft. in a hard glassy rhyolite on the property. Loss of gage must be carefully watched during the drilling of longer runs.

Stainless Steel Wheel Treads

Stainless steel treads are mounted on mine car wheels at the Mountain Copper Co., Ltd., property near Redding, Calif., to prevent corrosion by acid mine water encountered in wet sections of the tunnel. Flanges and treads of conventional wheels which have been corroded are turned down on a lathe. Then stainless steel treads are shrunk on as shown. Wheels with these treads last four times as long as conventional wheels.



Congress passed in 1937. More than 50% of the mineral-bearing or mineralized areas of Jefferson, Jackson, Coos, Curry and Douglas Counties in southwestern Oregon are included in this territory according to the Raw Materials Survey, Portland, Ore.

Refractory clay, bauxite, gold, silver, lead, zinc, copper, barite, bentonite, chromite, magnesite, nickel, and talc deposits exist in this area.

A locator on O and C lands must conform to State and Federal laws, as well as regulations of H.R. 5049, covering the filing for record in the U. S. district land office.

Prospecting Rights Given in Lead-Zinc Area

Consolidated Mining and Smelting Company of Canada, Ltd., and Ventures, Ltd., have received a concession granting the exclusive right to prospect some 500 sq. mi. on the south shore of Great Slave Lake in the Northwest Territories. Application was made to the Department of Mines and Resources early in 1948 in the name of Consolidated Smelters and Ventures. The Northern Lead-Zinc Co. has been given a one-third interest in the concession.

Presence of lead-zinc mineralization in this area has been known for many years. Serious development started in 1929 with the organizing of the Northern Lead-Zinc Co., financed by Consolidated Mining and Smelting and Ventures, which companies still control Northern Lead-Zinc. More than $300,000 was spent in prospecting and half-a-million tons of ore was indicated averaging about 7% lead and 9% zinc.

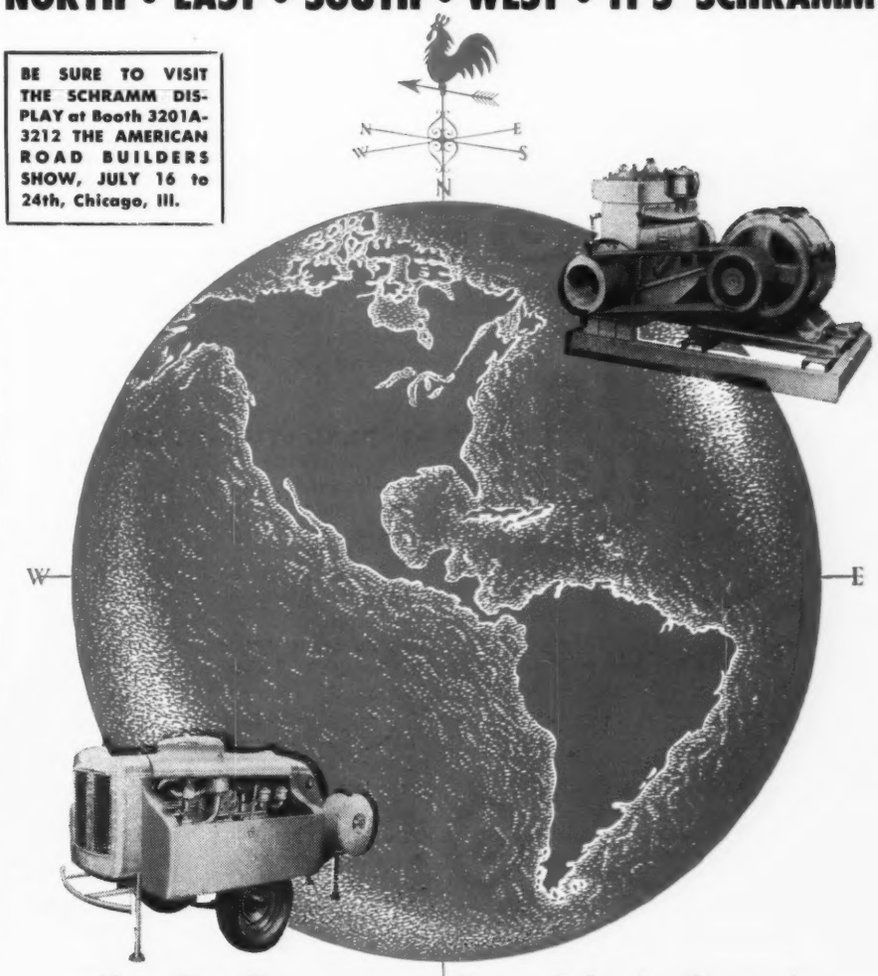
Because of the absence of outcrops, the only practical method of exploration is a broad program of widely spaced churn drill holes, designed in the hope of locating new ore localities similar to the one known. Such a program could not be carried out under existing regulations governing claim-staking and a concession was the only possible solution. The concession calls for expenditures of $50,000 during the first year and $75,000 during each of the two succeeding years. One-half the area must be relinquished after the second year. Claims may be staked during the period of the concession.

Missouri School of Mines to Study Explosives

Dr. J. D. Forrester, Department of Mining Engineering, Missouri School of Mines and Metallurgy, has announced a research project and scholarship to study the effectiveness of various explosives, beginning in the early fall. The scholarship provides opportunity to do full-time graduate work and a salary-stipend of $200 a month for two years.

NORTH • EAST • SOUTH • WEST • IT'S SCHRAMM

BE SURE TO VISIT THE SCHRAMM DISPLAY at Booth 3201A-3212 THE AMERICAN ROAD BUILDERS SHOW, JULY 16 to 24th, Chicago, Ill.



The Air Compressor You Like to Operate

compact . . . no waste space, compressor and engine coupled into a single, rigid, permanently aligned unit . . . balanced to reduce wear and increase efficiency!

lightweight . . . Portables designed for quick handling to and from the job, stationary units vibrationless.

easy to start . . . Just push the built-in electric starter, and the Compressor starts . . . to give you a continuous amount of air.

TOOLS FOR THE JOB

Schramm Inc. also has a complete line of Pneumatic Tools to offer and recommend for operation by their Compressors.

These include Rock Drills, Paving Breakers, Trench Diggers, Clay Spades, Backfill Tampers, Tie Tampers, Sheeting Drivers, Demolition Tools, Chain and Circular Saws.

Write for bulletins and prices.

. . . For these reasons users of Schramm Air Compressors have said they *like* to operate both stationary and portable Schramm units.

Other features, however, enter into the usefulness of Schramm. There's 100% water cooled feature, allowing you to operate Schramm perfectly both summer and winter; mechanical intake valve, forced feed lubrication, to mention a few.

Schramm features make them the Air Compressors ideal for your many jobs . . . and the reasons they're specified North, East, South and West. Write today for data.

SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER • PENNSYLVANIA

NEW BOOKS

FROM THE GROUND UP. By Paul M. Tyler. McGraw-Hill Book Co., 330 W. 42nd St., New York, 1948. Pp. 248. Price, $3.50.

Written primarily for readers unacquainted with mineral industry processes and economics, this comprehensive review of how the mineral industries operate, of their importance, and special attributes, is also interesting reading and source material for the initiated. The consequences of handling wasting assets and the need for special tax consideration are well discussed. The importance of domestic mining to national security and the mineral resource inventory problem are treated. Also discussed are: our mineral position, wages, depletion, tariffs, subsidies, incentives, and taxation. Features of a sound national mineral policy are recommended.

Study of this book is worth anybody's time, whether one is within or outside the mineral industry.

RAW MATERIALS IN WAR AND PEACE. By "Associates in International Relations." Published by Department of Social Sciences, U.S. Military Academy, West Point, New York, 1947. Pp. 221. Price, $1.00.

A comprehensive discussion of the vital importance of raw-material preparedness in meeting a national emergency, portraying the futility, in these times of total war, of detaching the purely military aspect from industrial productivity. After discussing raw-material policies of various countries in preparing for war, and the raw-material policies of the United States prior and during the World War II, the authors close by recommending stockpiling and maximum dependence on imports.

The attitude is strongly anti-tariff, embracing without reservation the viewpoint of the State Department toward foreign trade policies and failing to take into account the military desirability of fostering domestic raw-material production. The approach toward conservation is both academic and socialistic. Participants in private-enterprise waste of resources are portrayed as conscienceless "exploiters," whereas in fact much of the waste was beyond economic control. The implication that socialistic controls would cure these evils takes no account of the fact that after all, private enterprise is dynamic and productive, while socialism has yet to prove its dynamism or fruitfulness. Quite obviously the authors believe that private control of the mineral industry is obsolete, as indicated in the following quote: ". . . the production and sale of raw materials were regarded [1920-1940] as just another industry, entitled to exactly the same consideration — including maintenance of free enterprise and private property rights—as accorded to other industries. It was but natural that such wholesale disregard for the international facts of life should result in relatively undynamic governmental policies . . ."

INTERNATIONAL INDUSTRY YEARBOOK. By Lloyd J. Hughlett. Kirsten-Browne Publishing Co., 551 Fifth Ave., New York 17, N. Y. Pp. 414. Price, $10.

An editor in any one of the many fields of technology knows only too well how often the mail and the telephone bring requests for information as to the technical practice in his field —usually from a non-technical man. Such requests come from management down to students. In the International Industry Yearbook we have a book written in semi-technical language and designed primarily for management in industry, which will be useful to other groups and in many kinds of work, including manufacturers of industrial equipment, advertising copy writers and libraries. The contents comprise 27 heavily illustrated articles by well-informed writers which deal with the features of up-to-date practice in many fields ranging from air conditioning through physical metallurgy and mining to railroads, rubber, and textiles. Much useful up-to-date information is contained in the book's 400-odd pages. Each article concludes with an extended bibliography, a most valuable feature. The volume has been carefully indexed.

ERUPTIVE ROCKS. THIRD EDITION. By S. James Hand, Newberry Professor of Geology, Columbia University, New York City. Published by John Wiley & Sons, Inc., New York. Pp. 488. Price, $7.50.

In this new edition Professor Hand continues his efforts to establish a more logical basis for the classification of eruptive rocks than has heretofore existed. After carefully evaluating the various factors upon which a system of classification can be based such as chemical analysis, mineralogical composition, texture, order of crystallization, etc., the author proposes a system of petrography which takes into account: (1) crystallinity, (2) degree of saturation with silica, (3) relative abundance of alumina, (4) color index, and (5) the character of feldspar. Using various symbols to classify rock under this system, he shows for example that a metaluminous soda-granite with 22% dark minerals might be designated as "XOmβ(22)" indicating that the rock is eucrystalline; oversaturated with silica; metaluminous (the proportion of alumina exceeds that of soda, potash, and lime combined); orthoclase is more abundant than anorthite but less abundant than albite; and that dark minerals amount to approximately 22% of the constituents.

In addition to this thesis, the text discusses constituents of eruptive rocks, eruptive rocks and ore deposits, rock description, genesis of pegmatite, temperature and pressure in the magma and other related subjects.

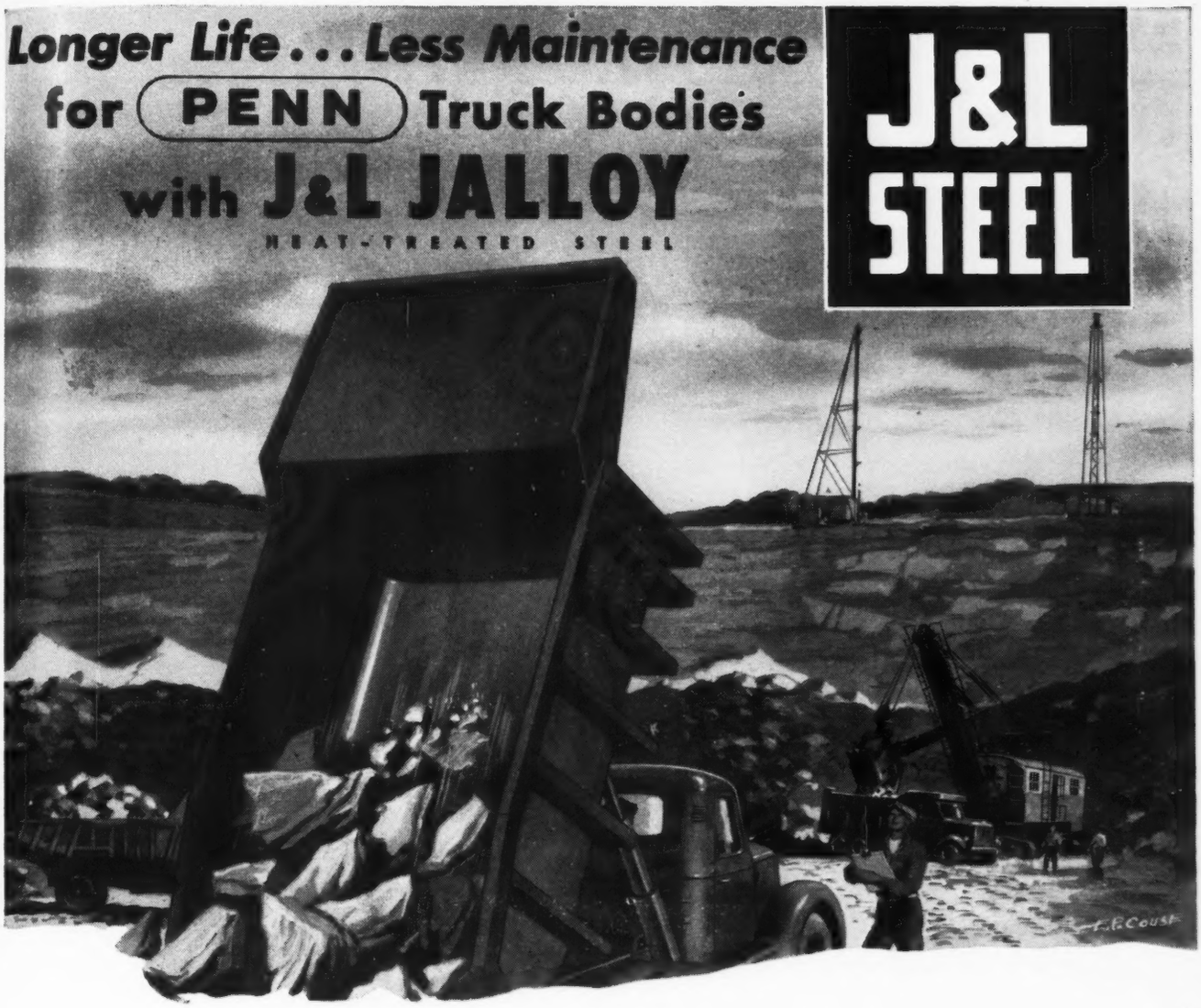
FIELD TESTS FOR THE COMMON METALS. Ninth Edition. By George R. Fansett. Published by the University of Arizona in Arizona Bureau of Mines, Technology Series No. 42, Bulletin 154. Pp. 56. Price 35¢ to non-residents of Arizona, free to residents.

Field tests for the identification of 32 common metals and minerals are described in comparatively non-technical language in this bulletin. The text includes a list of necessary testing equipment, reagents, and a brief discussion of blowpipe technique.

GUIDE TO THE GEOLOGY OF CENTRAL COLORADO. Vol. 43, No. 2, Colorado School of Mines Quarterly. Sponsored by the Rocky Mountain Association of Geologists. Published by the Colorado School of Mines, Golden, Colo. Pp. 176. Price, $3.

Contributions of 16 geologists are published in this volume which was compiled for field trips taken by members of the American Association of Petroleum Geologists during their recent annual meeting in Colorado. Although the volume was prepared for petroleum geologists, it contains many chapters, maps and other information of interest to mining men as well. Topics of this nature which are discussed and illustrated include: The Oil-Shale Demonstration Plant; Oil-Shale Deposits of the Naval Oil-Shale Reserve; The Climax Molybdenite Deposit; and the Leadville, Kokomo, and Gilman mining districts.

An index map showing major geologic structures, and road logs for many miles of Colorado's highways are provided for the convenience of travelers who wish to study local geology firsthand. Notations in the logs call attention to such features as pegmatite dikes, reptile tracks, porphyry sills, ripple marks and other interesting items.



Leading Dump-Truck Body Builder Pioneers Use of Heat-Treated Steel for Bottom Plates

Hockensmith Corporation, Penn Body Division, of Penn, Pa., puts real meaning in its slogan: "*Strength · Service · Economy*" by using J&L Jalloy and Otiscoloy steels.

J&L Heat-Treated Jalloy for truck bottoms resists the terrific shocks and abrasion encountered in heavy-duty operations, while J&L Otiscoloy High-Tensile Steel frame members and other parts reduce dead-weight to a minimum without sacrificing strength.

One mine operator reports that his stone trucks equipped with heat-treated Jalloy run an entire season without bottom replacements—an unheard of record in the mining industry where the materials handled are highly abrasive. In addition because longer wear reduces repair, his maintenance welding crew has been cut *84%* since using Jalloy!

J&L Jalloy is a *modern* steel for products that must be tough and strong—heavy-duty truck bodies, power-shovel buckets, dump-cars, bulldozers, scrapers, rock crushers, sand-blast equipment, and wherever abrasion is a limiting factor in the life of a product.

J&L Jalloy—a fine-grain, heat-treated steel—has an inherent ability to withstand impact and abrasion. A wide range of physical properties, with strengths up to *155,000 lbs. per sq. inch*, are available.

If you need a steel with *better* abrasion resistance, or if you want longer life from products made of steel, let us send you data on J&L Jalloy, including information on properties, heat-treatments and workability. The data booklet: "Jalloy—J&L Alloy Steel" is available on request. Use the coupon.

Jones & Laughlin Steel Corporation
Room 412, Jones & Laughlin Building
Pittsburgh 30, Pennsylvania

Please send me complete data on Jalloy and the booklet: "Jalloy—J&L Alloy Steel."

NAME_____

TITLE_____

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CITY_____ STATE_____

JONES & LAUGHLIN STEEL CORPORATION

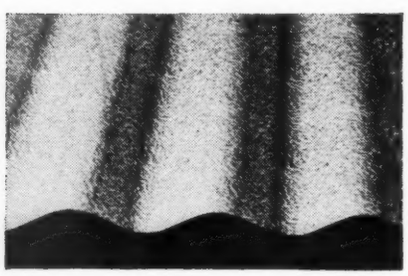
EQUIPMENT NEWS

Prime Mover for Materials Handling

This prime mover made by the Bell Aircraft Corporation, Buffalo, N. Y., is powered by a 3-hp. air-cooled engine which operates for eight hours on three gallons of fuel. Shown here, the prime mover can climb a 20% grade with a capacity load of 1,000 lb. of dry or wet material.

The self-dumping bucket has a capacity of 10 cu. ft. which can be increased to 18 cu. ft. for lighter materials. The bucket may be replaced by a spacious self-dumping platform. A snow-plow attachment is also available which is suitable for grading loose materials.

Transmission, clutch and gears are completely enclosed, and no belts or chains are used to transmit power from the engine. Designers of the equipment have aimed to make it rugged enough to perform satisfactorily on construction projects and in plants.

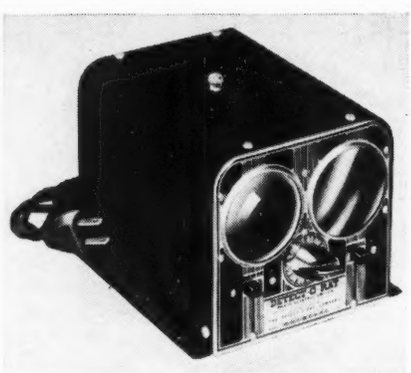


Embossed Aluminum

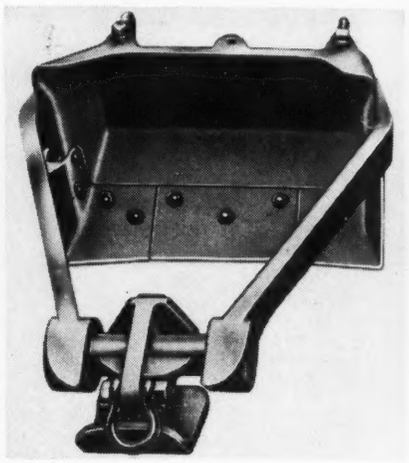
A new corrugated aluminum sheet for roofing, siding and similar structural uses has been developed by Reynolds Metal Co., Louisville, Ky. In addition to standard lengthwise corrugation, the material has an embossed finish which increases the rigidity of the sheet, minimizes glare, and provides a pleasing uniform appearance.

General Purpose Varnish

General Electric Co., Schenectady, N. Y. announces a new thermosetting, phenolic drying-oil varnish called GE-9574 which is suitable for all types of electrical windings including enamel, cotton, asbestos, and glass-covered wire. The new varnish is resistant to oil, acid, alkali, salt water, moisture, heat, and is suitable for infra-red baking.



FIRE WARNING OR BURGLAR ALARM will throw switch for fire alarm and can be used on automatic counters, conveyor controls, and safety shut-offs. Detect-O-Ray Co., Chicago 14, Ill. is the manufacturer.



Alloy-Steel Scraper

A new 34-in. scraper shown here, has been added to the line of Model A slushing scrapers manufactured by Alloy Steel and Metals Co., manufacturers of Pacific Products. The scraper is of all-welded construction, self-sharpening, and contains manganese steel corner cutters. The unit contains runners of wear-resistant steel that allow the scraper to ride over all obstructions on the back haul without damaging the digging blades. The company also announces a Model B 42-in. scraper which weighs 990 lb. and is designed so that it can be disassembled for installing in places too small to accomodate an all-welded scraper.

Stainless-Steel Valve

A new low-pressure stainless-steel drain valve for vats, tanks, and kettles is announced by Ketchpel Engineering Co., West Englewood, N. J. Both vertical and horizontal types are available in sizes ranging from 1½ in. to 6 in. The valve has proven to resist deterioration from corrosive liquids at 212 deg. F.

Aluminum Mine Cables

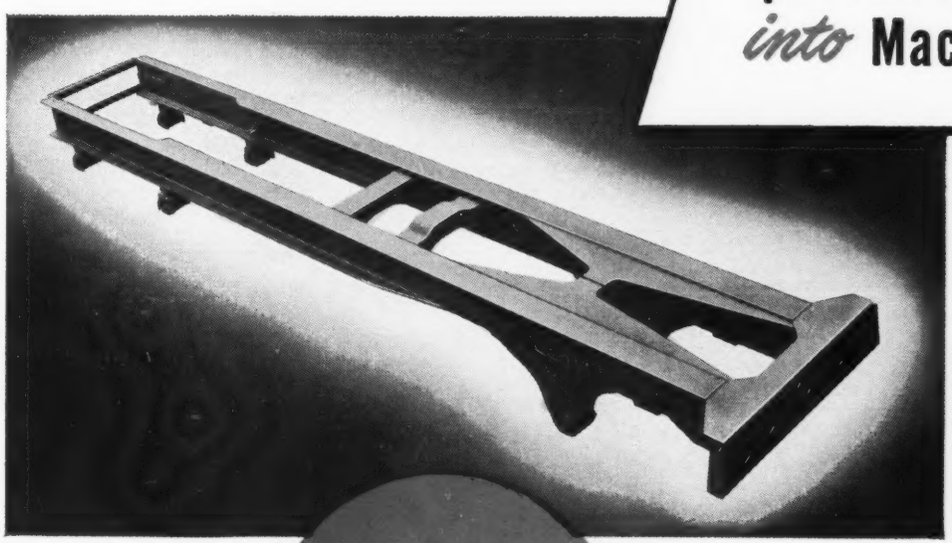
United States Rubber Co. announces that it is ready to begin full-scale production of aluminum bore-hole and mine entrance cables which permit a 30 to 50% saving in cost and a 50% saving in weight over equivalent copper cables. Both types of cable, recently installed in Alabama mines, have successfully passed all tests. Because of lighter weight, aluminum bore-hole cables can be lowered and supported without the use of elaborate equipment. The aluminum cables are covered with a neoprene rubber compound which resists oils and acid water. Both types of cables are made in sizes ranging from 6 AWG. to 1,000,000 circular mils.

(Continued on page 114)

30-Ton Payloads are hauled with unfaltering ease over the toughest terrain on Mack's Model LRSW. There's abundant power in its 275 h.p. diesel engine. Positive traction because of its Balanced Bogie and exclusive Power Divider. Safe and sure control through hydraulic power steering, air-assisted clutch, air-actuated brakes, short turning radius and offset driver's seat.

You get more work *out* of Mack Trucks

because...we put more work *into* Macks



Massive ruggedness, unrivalled in the truck field, stands clearly revealed in the Model LRSW frame. Electrically welded into one piece, it combines brawny cross members, ample gusseting, and huge reinforced I-beam side members of alloy steel, 13-11/16" deep with 8" flange.

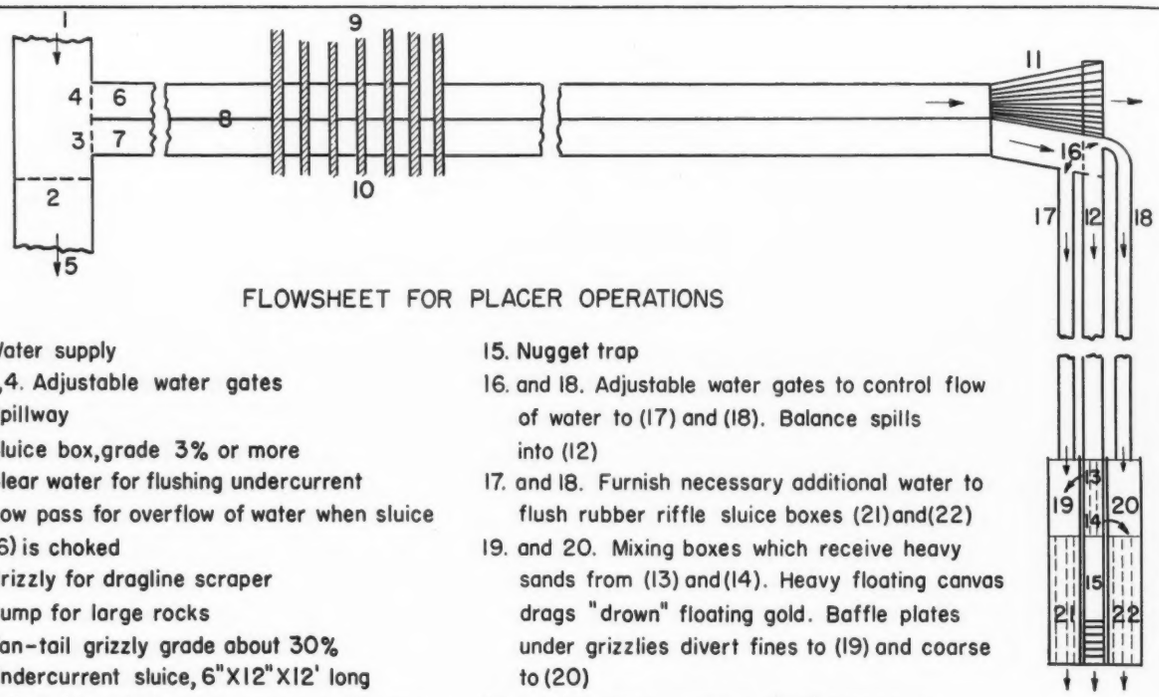
Mack

trucks for every purpose

6588

SINCE 1900, AMERICA'S HARDEST WORKING TRUCK

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.



FLOWSHEET FOR PLACER OPERATIONS

1. Water supply
2, 3, 4. Adjustable water gates
5. Spillway
6. Sluice box, grade 3% or more
7. Clear water for flushing undercurrent
8. Low pass for overflow of water when sluice (6) is choked
9. Grizzly for dragline scraper
10. Dump for large rocks
11. Fan-tail grizzly grade about 30%
12. Undercurrent sluice, 6"X12"X12' long
13. Adjustable grizzly set to pass only the fine gold, grade about 15%
14. Adjustable grizzly set to pass coarser gold, grade about 15%
15. Nugget trap
16. and 18. Adjustable water gates to control flow of water to (17) and (18). Balance spills into (12)
17. and 18. Furnish necessary additional water to flush rubber riffle sluice boxes (21) and (22)
19. and 20. Mixing boxes which receive heavy sands from (13) and (14). Heavy floating canvas drags "drown" floating gold. Baffle plates under grizzlies divert fines to (19) and coarse to (20)
21. and 22. Rubber riffles, 1'X6', hinged at upper end with adjustable supports at lower end.

Placer Flowsheet Uses Adjustable Grizzlies and Rubber Riffles

The above placer arrangement was used successfully for power dragline operations. Approximately 90% of the material was eliminated over the fan-tail grizzly (11); 8% went over the adjustable grizzly (14); and 2%, containing black sands and gold, reached the rubber rifles (21) and (22).

The rubber riffles (21) and (22) have hinged supports at one end, and adjustable supports at the other. The grade varies from 10 to 20%. Each riffle contains hundreds of globe-like cells which produce a swirling eddy strong enough to throw out the sand but retain the gold. The strength of the eddy is controlled by the amount of water passing over the riffle, and the fall in the sluice. As only one-half inch of clear water is used, the panning action of these eddies can easily be observed and controlled.

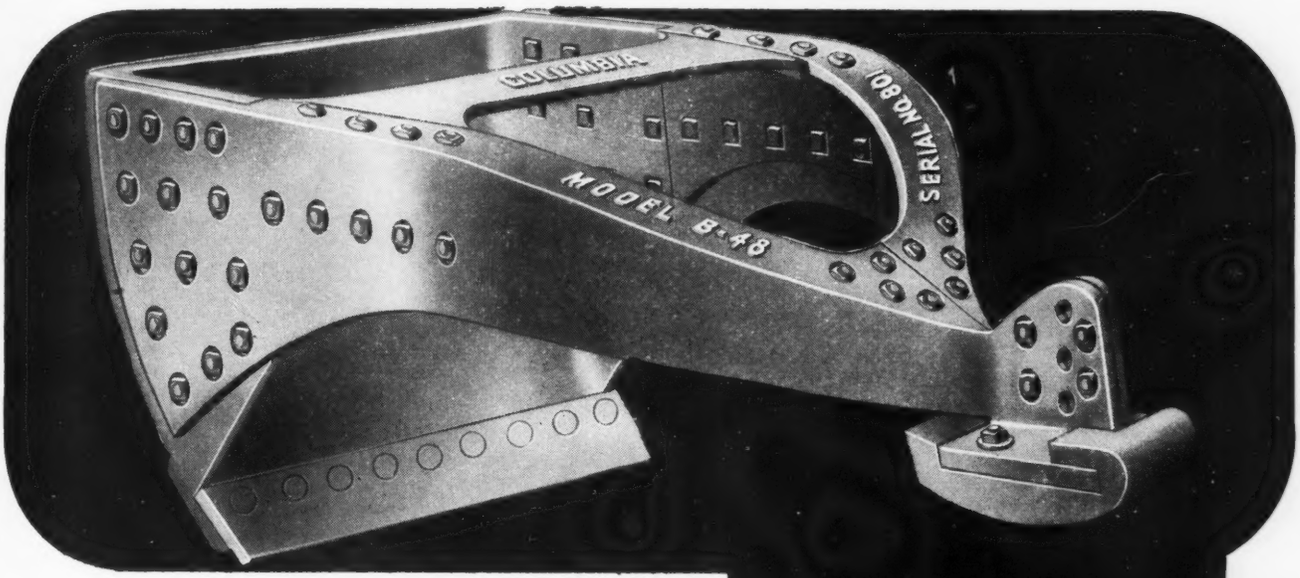
The fan-tail grizzly (11) is made of heavy-angle iron 1 in. or wider, and 3 ft. long, bolted close together at the upper end, and bolted on blocks about 1 in. apart at the lower end. An apron dumps all sands into sluice box (12).

V. L. Holt, 5225 S. E. Morrison St., Portland, Oregon, who submits this information, can supply the rubber riffles, fan-tan grizzlies, and adjustable under-current grizzlies.

Germicidal Lamp for Mine Change Room

A new bactericidal lamp that emits more than twice as much ultraviolet radiation as lamps heretofore available has been developed by the Westinghouse Lamp Division, Bloomfield, N.J. It is the 36-in. long, instant start, Slimline Germicidal Sterilamp which may be operated at three different levels of ultraviolet intensity. The installation shown is at the Hanna Coal Company's Willow Grove mine. Lamps are installed above the tile walls to kill airborne bacteria in the change room.

Columbia's MODEL "B" SLUSHING SCRAPER



48"-54"-60" SIZES for LARGER OPERATIONS

As companion to the Model A Scraper, Columbia proudly presents their Model B, a slushing scraper designed to fill the needs of large scale tunnel and pit operations. Though similar in features to the Model A, this new model is larger, heavier and of bolted construction to facilitate transportation to the job.

Now Columbia offers a complete line of scrapers ranging from 26 to 60 inches in size. The "unit cast" Model A comes in 26-, 30-, 36- and 42-inch sizes; while the "assembled" Model B is manufactured in 48-, 54- and 60-inch widths.

CONSTRUCTION FEATURES OF THE MODEL "B" SCRAPER

- Cast Manganese Steel throughout.
- Assembled with ¾-in. heat-treated Steel Bolts and Self-locking Nuts.
- Replaceable Blade and Shoe (bolted).
- Heavy Runners protect Scraper on back-haul.
- Designed to minimize jogging and jolting.
- Webbed, Braced Construction.
- 3-hole Clevis Brackets permit flexibility.
- Maintains full capacity every haul.

FREE LITERATURE ON REQUEST

This familiar trade mark appears on every Columbia Casting. It is our stamp of inspection and your assurance of uniformly high quality.

Columbia
STEEL CASTING CO., INC.
PORTLAND 9, OREGON

COLUMBIA STEEL CASTING CO.
933 N.W. Johnson Street
Portland 9, Oregon

☐ Please send me without obligation complete information on the Model B slushing scraper.
☐ Complete information on Model A scraper.

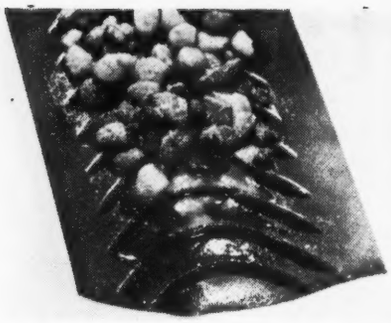
Name_____

Firm Name_____

Address_____

City_____ State_____

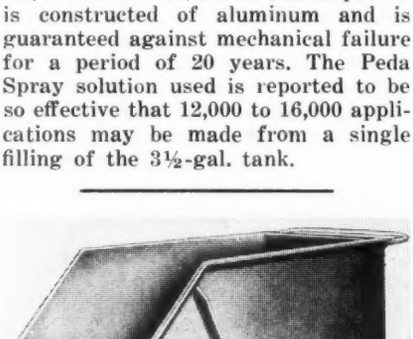
GRIZZLY BARS, SHEAVES, CAR WHEELS, MUCKING MACHINE WHEELS, BUCKET TEETH



R'B-TOPPED CONVEYOR BELT prevents backslip while carrying wet materials up steep inclines. This new type is announced by Goodyear Tire & Rubber Co.

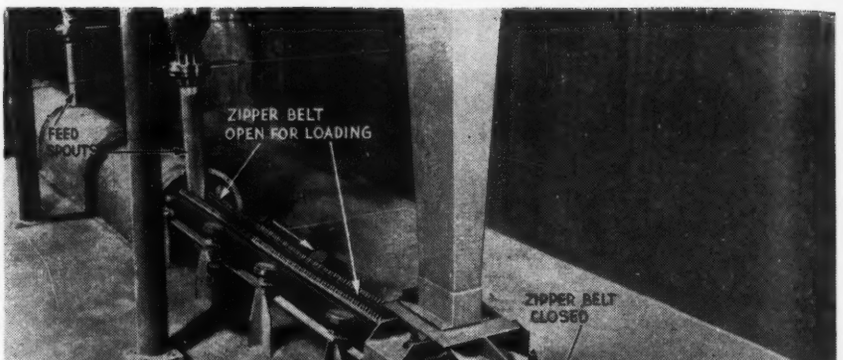
Foot Spray

A new foot spray dispenser for combatting athlete's foot is announced by Peda Spray Co., Inc., 26 East 42nd St., New York 17, N. Y. The dispenser is constructed of aluminum and is guaranteed against mechanical failure for a period of 20 years. The Peda Spray solution used is reported to be so effective that 12,000 to 16,000 applications may be made from a single filling of the 3½-gal. tank.



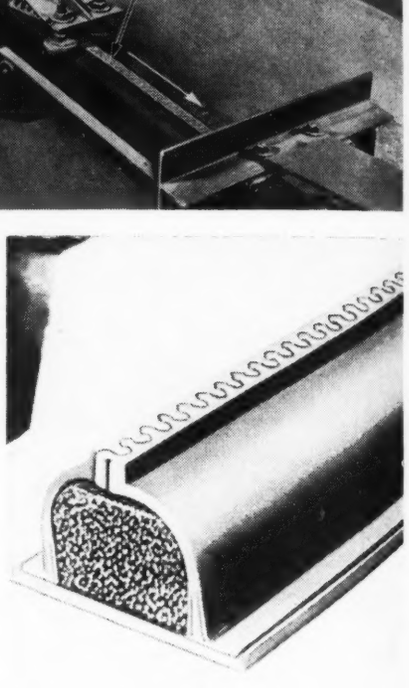
Dump Carriage

Hauling and dumping of scrap materials or powdered chemical and reagents is made easy with the Phillips "Phil-Dump" Junior shown above. This rubber-tired unit can be hand pushed or used with a fork-lift truck. Overall dimensions are 48 x 28¼ x 38¼ in. Capacity is one-half cu. yd. For further information write Phillips Mine and Mill Supply Co., Pittsburgh 3, Pennsylvania.



Zipper Conveyor Elevator

Materials can be conveyed or elevated in any plane and in any direction with the new Zipper Conveyor Elevator recently announced by Stephens-Adamson Manufacturing Co., Aurora, Ill. When empty, the belt is open and flat and passes around pulleys in any position. At loading points spouts fill the belt with material. Thereafter it is zipped shut at closing points and routed to any part of the plant. At discharge points the belt is unzipped and the contents dumped into hoppers. The loaded 4-in. belt caries .07 cu. ft. per linear ft. at speeds ranging from 1 to 200 f.p.m. Once the zipper teeth are meshed, they do not need additional devices to keep them together.



MINE TIMBERING MACHINE, announced by the Baker Industrial Truck Division of the Baker-Raulang Co. is battery-powered, tire-mounted. The hydraulically-controlled boom lifts timbers in place while workmen wedge them securely. The boom can swing 90 deg. to either side of center. A circular saw mounted on the machine is used to cut mine timbers.

Coolband For Hot Jobs

A soft sponge-rubber Coolband which absorbs perspiration and prevents it from dripping into eyes and on glasses has been announced by the Mines Safety Appliances Co., Pittsburgh 8, Pa. It may be cleaned by hand-squeezing in soapy water and may be sterilized by using a germicidal solution. For further information, write for Bulletin CE-15.

INDUSTRIAL NOTES

E. L. Klingler has been appointed assistant wire rope sales manager for **The Colorado Fuel and Iron Corporation.** He will continue to supervise the sales engineering force, and in addition assist **A. S. Rairden,** sales manager at Palmer, Mass.

Thomas T. Parker has assumed his post as pressed metal manufacturing engineer at the Portland, Oregon, plant of the **Hyster Co.**

The **Eagle-Picher Mining & Smelting Co.** has moved its general offices to the **First National Bank Bldg.,** Miami, Oklahoma.

Maynard B. Terry has been appointed general sales manager of the **American Brakeblok Division** of the **American Brake Shoe Co.**

Allan E. Goodhue, vice-president of **Chicago Pneumatic Tool Co.** died April 20, after a short illness.

Independent Pneumatic Tool Co. announces the opening of a new administration building adjacent to its main works at Aurora, Ill.

William D. Nesbeitt has been named manager in charge of **Allis-Chalmers** Spokane District office. He succeeds **A. R. Kohlmetz** who will remain in the Spokane office as special representative.

BULLETINS

Welding Instruction Book. Air Reduction Sales Co., 60 E. 42 St., New York 17, N. Y. announces a folder which describes five available welding and cutting books. For a copy of the folder write to Department A19—24P.

Flue Gas Analyzer. A new Davis unit for analyzing the composite of stack gases is described in this illustrated bulletin No. 1136A. Write to Davis Emergency Equipment Co., Instrument Division, 45 Halleck St., Newark 4, N. J.

Magnetic Separators. A data sheet covering special features and typical installations of the new Dings Alnico Perma-Pulley Magnetic Separator. Copies available at Dings Magnetic Separator Co., 4740 W. McGeogh Ave., Milwaukee 14, Wis.

Speed Selector. The Variable-V-Planetary speed selector is described and illustrated in a bulletin by the B. F. Goodrich Co., Akron, Ohio. The unit provides any speed change from zero to 800 r.p.m. at constant torque.

Hose Fitting. Catalog section 3100 3-48 which compiles fittings and couplings for rubber hose has been released by B. F. Goodrich Co., Akron, Ohio.

Centrifugal Blowers. Bulletin G-82 of the Roots-Connersville Blower Corporation, Connersville, Indiana, briefly describes the entire line of the company, including many types of centrifugal and rotary blowers.

Earth Moving Unit. Application photographs and diagrams are featured in a new four-page Tournadozer folder prepared by R. G. LeTourneau, Inc., Peoria, Ill.

Flexible Couplings. A new illustrated catalog on Baldwin-Rex chain flexible couplings has been released by the Baldwin-Duckworth Division of Chain Belt Co., Springfield 2, Mass. Write for Bulletin No. 48-6.

Roof Protection. A roof-maintenance guide has been prepared for free distribution by the Stonehard Co., 403 N. Broad St., Philadelphia.

New Uses for Perlite. Alexite Engineering Division of Alexander Film Co., Colorado Springs, Colo., offers an interesting eight-page booklet illustrating the use of Peralex (perlite) in roof decks, concrete bricks, plaster, masonry, and for such purposes as sound-proofing, insulating, and fire-proofing structures.

Magnetic Tramp-Iron Remover. A giant heavy-duty permanent magnetic separator for removing tramp iron is described and illustrated in a booklet released by Eriez Manufacturing Co., Erie, Pa.

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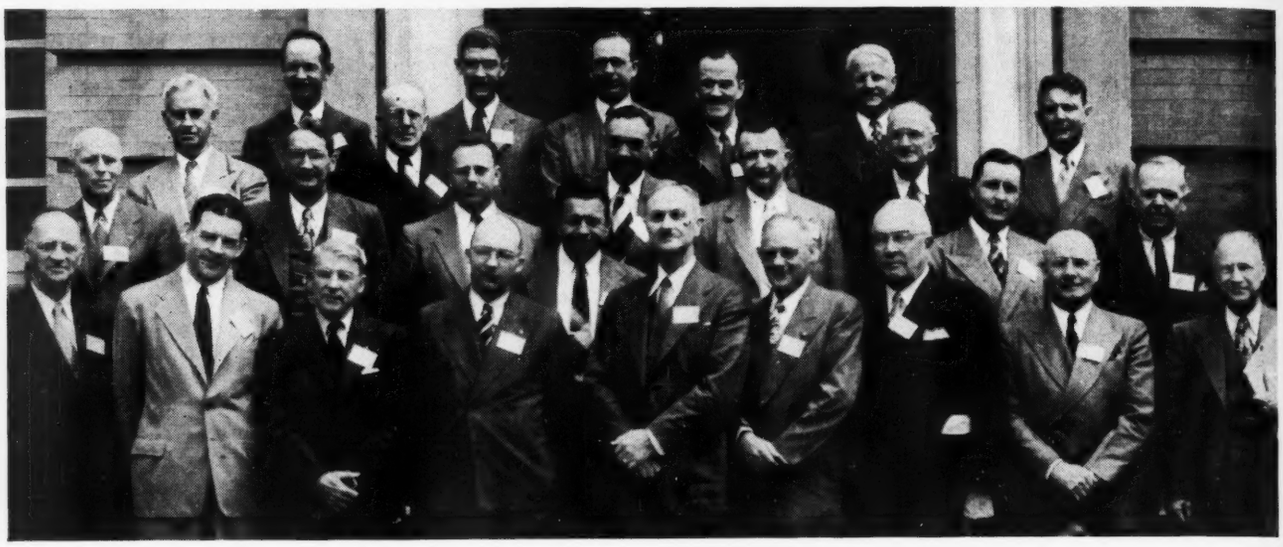
PERSONAL NEWS



STATE GEOLOGISTS who attended the recent annual meeting of the Association of American State Geologists, at Tuscaloosa, Ala., where they celebrated the 100th anniversary of the founding of the Alabama Geological Survey. Left to right, the geologists are: Front row—E. P. Rothrock, South Dakota; John H. Melvin, Ohio; Faye W. Libbey, Oregon; Wilson M. Laird, North Dakota; Edward L. Troxell, Connecticut; Garland Peyton, Georgia; George E. Condra, Nebraska; M. M. Leighton, Illinois; George M. Schwartz, Minnesota. Second row—Sheldon Glover, Washington; Meredith E. Johnson, New Jersey; Leo Hough, Louisiana; Walter B. Jones, Alabama; Robert Dott, Oklahoma; Paul H. Price, West Virginia; S. H. Cathcart, Pennsylvania. Third row—W. C. Morse, Mississippi; Raymond C. Moore, Kansas; John T. Lonsdale, Texas; E. F. Bean, Wisconsin; Charles Deiss, Indiana. Fourth row—Edward L. Clark, Missouri; H. Garland Hershey, Iowa; T. R. Meyers, New Hampshire; Gerald Eddy, Michigan; Herman Gunter, Florida.

Floyd H. Lee has returned from the tin mining district of Bolivia to Hibbing, Minn., where he will resume work as an engineer on the Mesabi range.

John M. Bush, manager of the land and lumber department of the Cleveland Cliffs Iron Co. at Ishpeming, Mich., since 1925, retired on May 1. He had been with the Company since 1901.

Irwin H. Cornell, vice president and sales manager of the St. Joseph Lead Co., retired on May 10. He will continue to act as a member of the company's board of trustees and of the executive committee. Mr. Cornell began his career with St. Joseph Lead in 1910 as assistant to the president; became secretary of the company in 1911; trustee in 1913, and vice president in 1915. When the Lead Committee was formed, under the auspices of Mr. B. M. Baruch of the Council of National Defense, he was elected secretary, and in this capacity was the special representative of all U. S. pig lead producers. He allocated all American lead production until early in 1918, when he resigned from the St. Joseph Lead Co. to become Lead Commodity Chief of the War Industries Board. Later that year he became Zinc Commodity Chief as well. He returned to St. Joseph Lead in 1919 as vice president and sales manager. During World War II Mr. Cornell served on various advisory committees for the metal industry. **Charles R. Ince,** his assistant since 1929, has succeeded him as sales manager. Mr. Ince was graduated from the School of Mines of Columbia University in 1926, where he lectured and conducted research in ore dressing until he joined the St. Joseph Lead Co. He will have as his assistants in his new position **Malcolm Bonynge** and **Dwight Marshall.**

J. C. Kinnear, Jr., former manager of Kennecott's Nevada Division at McGill and Ruth, has been appointed assistant to the manager of the Nevada division, **Walter S. Larsh.**

Edwin Sweetman, mining engineer and geologist, and his wife are members of the syndicate which purchased the Hotel Nicollet in Minneapolis. He has worked for the iron ore divisions of the Inland Steel Co., Jones & Laughlin Steel Corporation, and during the war years was with the Reconstruction Finance Corporation. Mr. and Mrs. Sweetman are now living in Green Bay, Wis.

W. J. Loring, mining engineer of Tonopah, Nev., received from the A.I.M.E. a gold pin and certificate placing him in "Legion of Honor" status upon his completion of 50 years of active service in the mining engineering profession.

George McHugh, manager of mines of the Simplot Fertilizer Co. of Pocatello, Idaho, has announced the following personnel changes: **H. B. Fowler,** from resident engineer at the Fort Hall mine to chief engineer of the exploration department; **C. W. Sweetwood,** from staff engineer to resident engineer at the Fort Hall mine; and **A. I. Taylor,** from junior engineer to staff engineer at the Fort Hall mine.

Jack P. Bonardi, metallurgical engineer, and Mrs. Bonardi sailed from New York May 3 on the S. S. Nieuw Amsterdam for Rio de Janeiro to attend the 39th annual convention of Rotary International. They will return about the middle of July.

A. O. Hall will direct the American Smelting & Refining Co.'s exploration activities in Alaska, British Columbia, and Yukon. Formerly with the Salt Lake City office, Mr. Hall will now make his headquarters in Vancouver, B. C.

P. C. Emrath of Golconda, Ill., has recently entered the consulting field in the Illinois-Kentucky fluorspar-lead-zinc district.

J. H. Scarfe, of the metallurgical staff of Mount Isa Mine, Ltd., has resigned to accept a position with the Western Mining Corporation at Kalgoorlie.

Carl J. Trauerman, Butte, secretary of the Mining Assn. of Montana, will be on the program of the annual convention of the National Assn. of Se-

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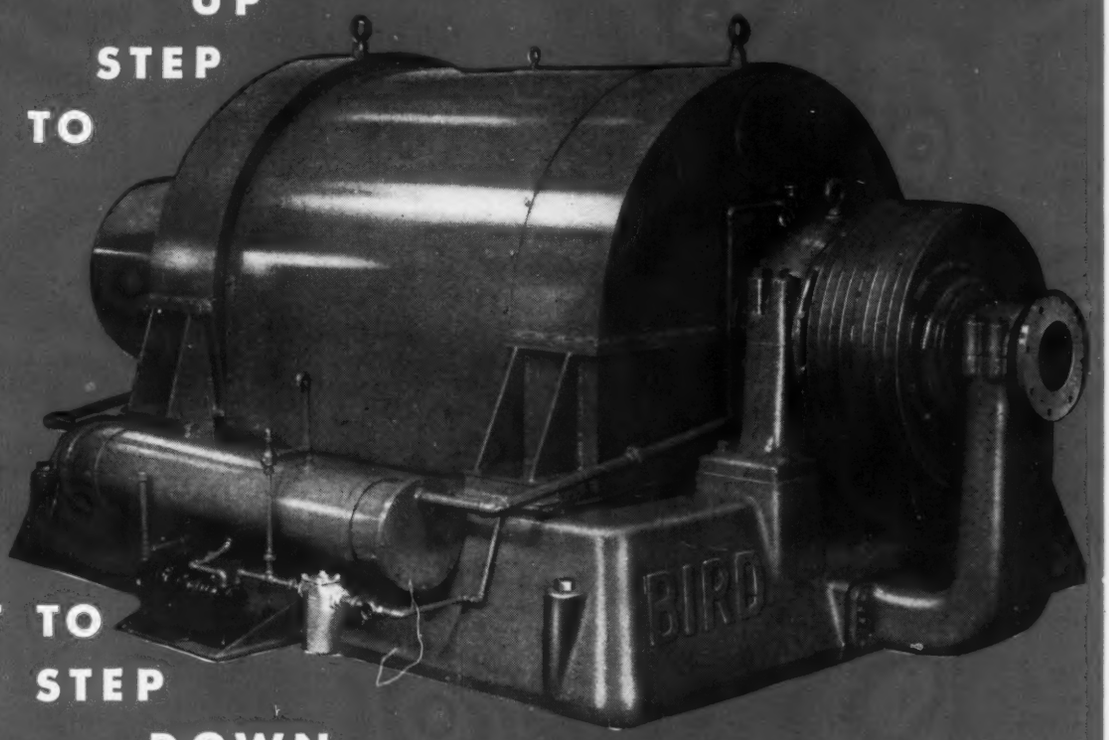

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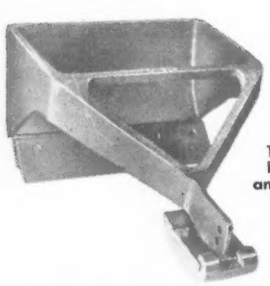

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curities Administrators at the Multnomah Hotel, Portland, Ore., July 19 through July 22.

Arnold H. Miller, consulting engineer, has announced the removal of his office from 140 Nassau Street to the Equitable Bldg., 120 Broadway, New York City.

A. H. Dutton, former Inspector of Mines, Fiji, is now on the exploration staff of Broken Hill South, Ltd.

William B. Boggs, since 1927 smelter superintendent of Noranda Mines, retired from that position to become consulting metallurgist. His assistant, **J. N. Anderson,** has succeeded him.

Joe House, manager of the Lowhee Mining Co., Ltd., at Wells, B. C., has been placed in charge of new hydraulic operations in the Manson Creek district by the Yuba Gold Dredging Co. **C. G. Carlson,** field engineer of the Yuba Co., is drilling and testing potential dredging ground in the same area.

Charles Will Wright was in Italy and France during March and April looking into projects which may be of interest to private capital or may want Marshall Plan aid. He is now in Peru.

Frank M. Estes has been in New York on a short visit. For many years he has been manager in Colombia for the South American Gold and Platinum Co.'s principal subsidiary. He expects to return to Colombia soon.

James O. Rivard, mine electrician of Caspian, Mich., has been awarded a medal and citation by the Joseph A. Holmes Safety Assn. An employee of the James Mining Co., he risked his life to rescue his shift boss, **John Lewnick,** from a mine drift filled with sulphur dioxide gas.

Carroll Ward has been named general manager of the Deer Lodge Mining Co., operating the Emery mine in Powell County, Mont. He was formerly with the Montana Rainbow Mining Co. at Marysville. The Deer Lodge Mining Co., controlled by Porter Bros. Corporation, has appointed **Earl Hazelwood** mine manager and **Robert Woody** mill manager.

Dr. G. M. Furnival has resigned as director of mines for Manitoba to take a position with the Standard Oil Co. of California, with which he was associated before joining the civil service of Manitoba.

H. B. Newman, formerly underground manager of South Kalgurli Consolidated Ltd., Australia, has been appointed mine manager of that mine.

Wilbur F. Crisswell, Helena, Mont., has succeeded **Gailen T. Vandel** as chief engineer of Porter Bros. Corporation. Mr. Vandel is now vice president and general manager of the Jardine Mining Co. at Jardine.

William Benson, who has been chief engineer at the Hill-Annex mine of the Inter-State Iron Co. at Calumet, Minn., has been transferred to the Virginia headquarters.

D. A. Millman, who has been project engineering with Cleveland-Cliffs Iron Co., has been appointed superintendent of fee interests of the Eveleth-Burt-Rust, Barrows, Guff-Yawkey mines group on the Mesabi Range. He succeeds the late **W. R. Van Slyke.**

John J. Forbes, former assistant chief of the Bureau of Mines, succeeded Daniel Harrington as Chief of the Safety and Health Division on May 1. Mr. Forbes, who joined the Bureau of Mines as a first aid miner 33 years ago, has been assistant chief since 1945 and has been in immediate charge of the Coal Mine Inspection Branch since its inception in 1941.

G. T. Harley has been elected president of the New Mexico Miners & Prospectors Assn. Mr. Harley is manager of the Potash Division, International Minerals & Chemical Corporation, Carlsbad, N. M.

E. Cecil Roper, Jr., has replaced **C. P. Browning** as manager of Britannia Mining & Smelting Co., Britannia, B. C.

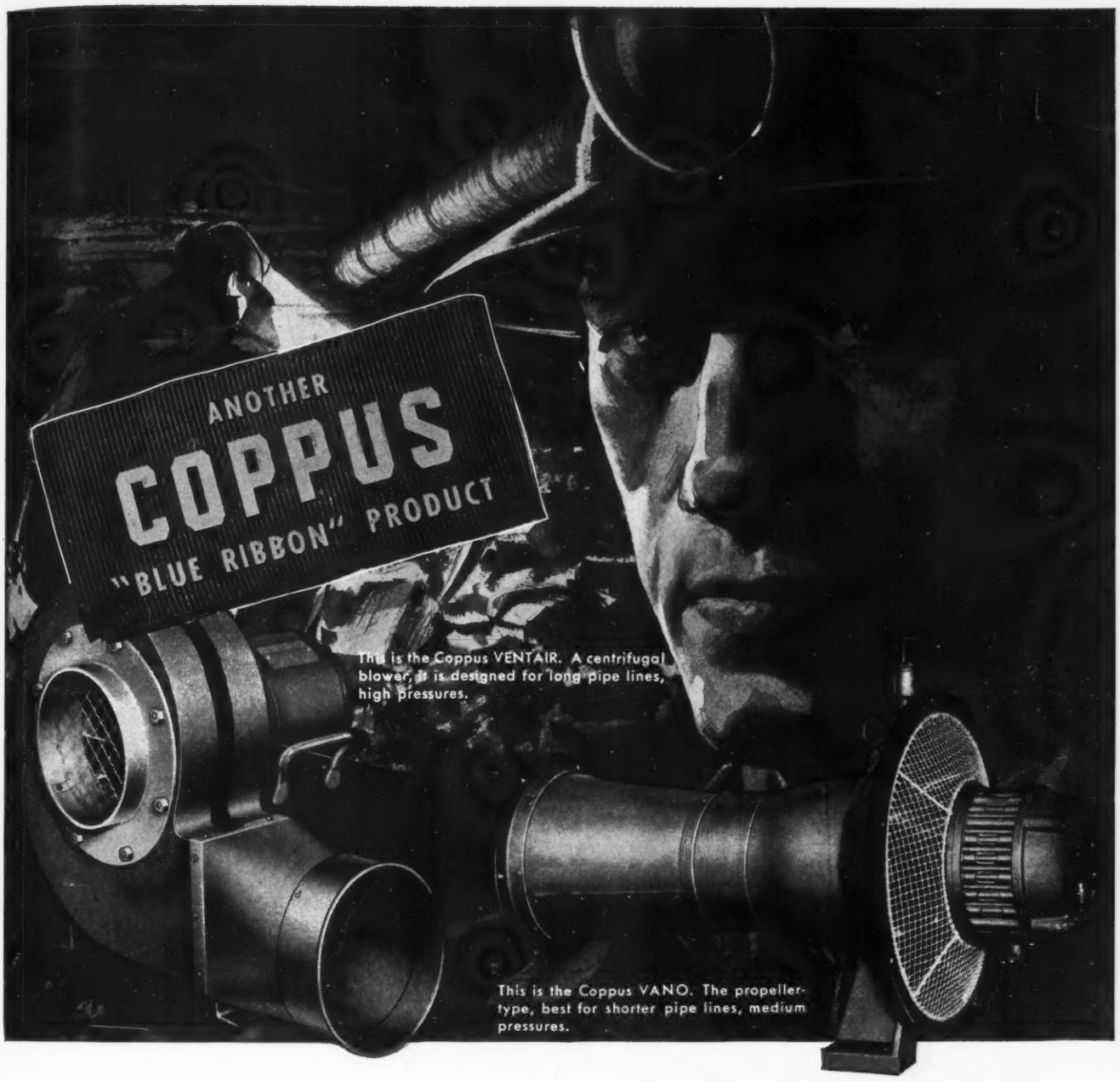
F. G. Brinsden, who received the Australasian Institute of Mining and Metallurgy medal for 1948, has retired from the general managership of South Kalgurli Consolidated, Ltd., and North Kalgurli (1912), Ltd. **A. A. McLeod,** former acting manager of Big Bell Mines, Ltd., has been named to replace Mr. Brinsden in the latter company. **A. E. Paton,** who has been assistant general manager of the two organizations, has also retired.

H. MacConachie has left the Western Reefs Exploration & Development Co. to become consulting engineer for the Anglo American Corporation of South Africa. He has been succeeded as manager of the former company by **H. M. Forrest,** who was manager of the South African Land & Exploration Co.

B. C. Colcord has been elected president of the Woodward Iron Co. of Woodward, Ala. replacing **H. A. Berg,** who retired. **Hewitt Smith,** former general superintendent of the company's coal and iron ore mines, is now a vice president.

Benjamin Johnson, assistant general manager to Braden Copper Co., has resigned and returned to the United States.

A. J. Cayia, manager of ore mines and quarries for Inland Steel Co., announced that effective May 1, **F. A. Olson,** superintendent of the Greenwood mine at Ishpeming, Mich., became superintendent of lands with headquarters in Ishpeming; **W. P. Reed** was advanced to assistant superintendent of the Bristol mine at Crystal Falls; and R. O. Marsten was promoted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to assistant superintendent of the Sherwood mine at Iron River.

Alexander N. Winchell has resigned after three years as resident consultant at the Stamford Research Laboratories of the American Cyanamid Co. He will renew his activities as a consulting geologist and crystallographer from his new headquarters at 88 Vineyard Road, New Haven, Conn.

A. J. Guscatt, safety engineer at the North Range Mining Co., has succeeded **L. S. Chabot, Jr.**, as superintendent of the Blueberry mine at Ishpeming, Mich. Mr. Chabot is now with the Tenn. Coal and Iron Co. at Birmingham, Ala. **P. A. Alexander** of Ishpeming, Mich., is in charge of surface operations for this company, replacing the late **Guy E. Nault. John A. Nicholson** is mining engineer, and **William Sirola** is geologist.

C. P. Girdwood has been appointed general superintendent of gold mining operations for Dome Mines, Ltd., of South Porcupine. Ont. He was previously chief engineer for the Company, and succeeds **W. H. Johns**, who died in October.

H. J. Hakala, mining engineer of the Oliver Iron Mining Co., is in Rio de Janeiro, Brazil.

Harrison Schmidt, mining geologist, will devote part of his time to being a private consultant, with an office at Cottage Sanatorium Road, Silver City, N. M.

Dr. Paul D. V. Manning, vice president of the Research Division, International Minerals & Chemical Corporation, Chicago, was elected to fellowship in the New York Academy of Sciences at the 130th annual meeting held at the Hotel Astor.

Dr. E. C. R. Spooner has been appointed professor of mining and metallurgy at the University of Adelaide. He is also director of the Bonython ore-dressing laboratories at the South Australian School of Mines & Industries.

CORRECTION:

The portable mining plant devised by the Nova Scotia Department of Mines, described in E&MJ April, 1948, pp. 84 and 85, included three four-wheel trailers carrying diesel electric units instead of two, as reported. Three 63-KVA generators are employed instead of one, as reported.

OBITUARIES

Charles N. Bell, mining engineer and alumnus of the Colorado School of Mines ('06), died Feb. 18 in Denver, Colo., of bronchial pneumonia. He first worked for the Champion Trio Mining & Milling Co., and later with the New England Exploration Co.; H. P. Whitney operations as manager of the company's Colorado department; U. S. Bureau of Mines as consulting

CHARLES N. BELL

engineer; Smuggler Union Mine at Telluride, Colo., for 14 years, where he was general manager; Cresson Consolidated Gold Mining and Humboldt mines as a director; and the King Lease, Inc., as president and manager. Mr. Bell was a former president of the Colorado Mining Association. He was awarded the Medal of Merit by the Colorado School of Mines. The medal was presented to Mrs. Bell at Commencement.

Dr. Alexander duToit of Capetown, South Africa, died in March. He was a member of the Geological Survey of the Union of South Africa from 1903 until 1920, when he became geologist to the Union Irrigation Department. From 1927 until 1941 he acted as consulting engineer to De Beers Consolidated Mines, Ltd. Dr. duToit was the recipient of several honors during his career, and through the books he wrote, stimulated interest in the geology of southern Africa.

James E. Kelly, Dillon, Montana, died on April 16, aged 69. He was a widely known attorney and mining man and brother of D. M. Kelly of Butte, who is administrative consultant of the Anaconda Copper Mining Co. "Jim" Kelly formerly was county attorney of Jefferson County and a valued member of the Mining Assn. of Montana and Beaverhead County Mining Assn. He was a past president of the latter organization.

Louis Samuel Hamilton, veteran equipment man and for many years manager in Salt Lake City for Western Machinery Co., died Apr. 15 in Salt Lake City.

William B. Daly, 75, died May 1 in Butte, Mont. A resident of that city since 1899, Mr. Daly began his mining career as a mucker, served 3 years as a practical miner, was made foreman of the East Gray Rock mine in 1907, superintendent of the Bell and Diamond in 1910, and superintendent of the employment department in 1912. The next year he was named efficiency engineer for all Butte properties. He was made superintendent of mines in 1914; and on the retirement of John Gillie as manager of mines in 1924, he was appointed to that position, which he held until his retirement in 1940. Mr. Daly was recognized as one of the leading operators in the industry and was an authority on cost accounting and mining methods.

James M. Little, mining engineer and geologist of the California Division of Mines, died in San Francisco Mar. 7. Mr. Little was a graduate of the School of Mines, Columbia University, and before joining the California Division of Mines was professionally active in the southwestern United States and Chile.

Earl R. Pembroke, 69, Utah mining engineer, died Apr. 26 in Salt Lake City. He attended Massachusetts Institute of Technology and Columbia University. Mr. Pembroke began his mining career as a consulting engineer, and later was a mine lessee in the Bingham and Tintic districts of Utah.

Lewis D. Hopfield, mining engineer, and one-time manager of the gold dredging division of Natomas Co., died in Alameda, Calif., on Apr. 16, aged 77.

Harrison Clare Henrie, general superintendent of the Copper Queen Branch, Phelps Dodge Corporation, and nationally known mining executive, died Apr. 23 at the Copper Queen Hospital, Bisbee, Arizona. He was 63. Starting as a mucker at the Lowell shaft of the Copper Queen, he remained with the organization and its successor, the Phelps Dodge Corporation, until his death. Mr. Henrie was president of the Warren Co., a Bisbee utility; a former national chairman of the mines division of the National Safety Council; a director of the Arizona section, American Institute of Mining and Metallurgical Engineers; and a director of the Arizona chapter of the American Mining Congress.

W. Burling Tucker, mining engineer, for many years district mining engineer, Los Angeles office, State Division of Mines, and for a short time State Mineralogist following the retirement of **W. W. Bradley**, died in Santa Monica, Calif., on Apr. 7. He was 68.

Jay P. Graves, 88, a pioneer mining man, died Apr. 24 in Pasadena, Calif. The mining claims in which he invested in British Columbia eventually led to his discovery of the low-grade copper deposits which later became the Granby Consolidated Mining, Smelting and Power Co., Canada's great copper producer. The Granby paid about $19,000,000 in dividends to Mr. Graves and his associates.

R. W. Harris, president of the Harris Clay Co., and long active in the china clay industry, died Apr. 26 at Ashville, N. C., following a major operation. He was 61.

Frank E. Shepard, of the Denver Equipment Co., died in Denver, Colo, recently. A graduate of Massachusetts Institute of Technology (1887), Mr. Shepard was director of the Denver Mint from 1923 to 1933.

REGIONAL NEWS

WASHINGTON

Johnston predicts improved bill—Northwest Lead and Eagle-Picher organize Associated Lead & Zinc

★ Associated Lead & Zinc Co. has been organized by Northwest Lead Co., a subsidiary of Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho, and the Eagle-Picher Co., Cincinnati, Ohio, to produce lead oxide and pigments, J. M. Bowlby, president of Eagle Picher and R. H. Cutting, president of Northwest Lead, reported in late April. Construction of the first unit of the new plant, to be located on Harbor Island, in Seattle, was to start immediately with production scheduled to begin late in 1948. The operation will be separate from the parent companies. Other incorporators are Carl A. Geist, vice president of Eagle-Picher, Stanley A. Easton, president of Bunker Hill, H. P. Lawrence, vice president of Northwest Lead, and Carl E. Croson, a director of Northwest Lead.

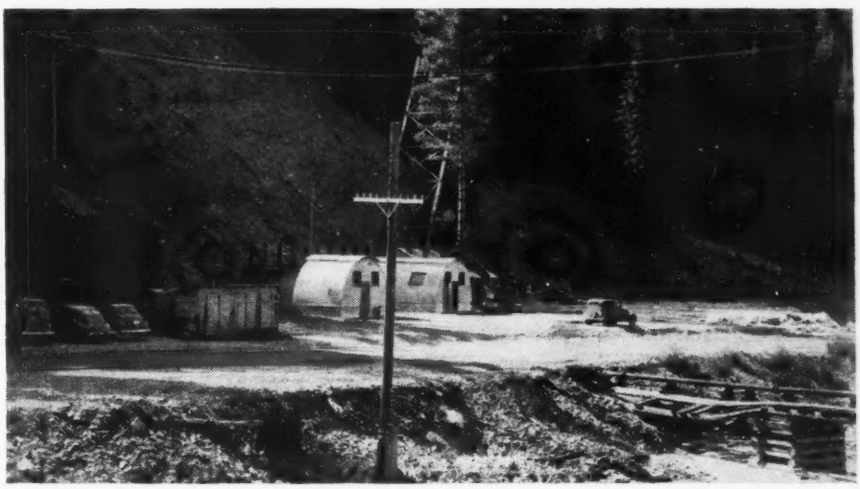
★ Pacific Mutual Silver Lead Co. has recently shipped a portable compressor, drill, and other mine supplies, valued at $4,000, to its property near Kellar, according to C. A. Gray, manager. A contract for 200 ft. of crosscutting has been let. Drifting has been done on the 90-, 107-, and 150-ft. levels in the No. 2 shaft. The ore contains values in zinc, lead, copper, and silver.

★ Howe Sound Mining Co. reported gross value of metals sold the first quarter of 1948 was $4,302,695, compared with $3,472,445 in the previous quarter; net value was $2,973,407, compared with $2,392,548; operating costs were $2,126,834, compared with $1,846,645.

★ The Morley Magnesium Foundries, Inc., is installing two furnaces of the continuous flow type, and retooling its new $300,000 plant, near Renton, where castings are produced, according to J. C. Morley, president.

★ Tom Moore and others, of Naches, have discovered bentonite in the Naches area. They report that an industrial firm in California has become interested, and samples are being tested to determine commercial value.

★ Elmer E. Johnston, chairman of Northwest Mining Association's Legislative Committee, upon his return from Washington, D. C., in April, predicted to members of the association that they would soon see a "constructive, workable securities bill dealing with all phases of financing, including primary mine financing."



HECLA MINING CO.'S ROCK CREEK OPERATIONS in the Coeur d'Alene district, where the company has started a deep tunnel development to prospect a group of claims two miles square.

★ A two to five-year research program to aid in the development and commercial uses of the State's pumice deposits has been initiated by the industrial research division at Washington State College, Pullman, under the direction of J. J. Wegner, chemical engineer.

★ Leo H. Timmins, president of Chromium Mining & Smelting Corporation, announced that rehabilitation work at the Mead plant was progressing satisfactorily in April with a crew of 20 men, and that ferrosilicon production should start in late May or early June. Mr. Timmins said he expected all four furnaces to be in operation within a year. Plans include ferrochromium production eventually, with chromite ores to be brought to the plant from foreign countries.

IDAHO

New orebody found at Polaris-Silver Summit shaft—Sunshine reports quarterly earnings and at operations three major orebodies

★ A dividend of 50c. per share for the second quarter of 1948 has been declared by the Bunker Hill & Sullivan Mining Co. Known ore reserves ready for mining as of January 1, 1948, were reported to be 2,870,945 tons, equivalent to about six years' supply under ordinary rate of production. Company officials state that there are no indications of approaching exhaustion of the mine, and that favorable geological conditions continue to exist in the lower levels and unexplored sections of the property.

★ An important mineral discovery has been made on the 3,000 level of the Polaris-Silver Summit shaft financed by the Polaris Mining Co. The ore encountered contains silver-bearing tetrahedrite and chalcopyrite but no lead values.

The new orebody has been proved thus far by more than 150 ft. of drifting where vein widths of 6 to 11 ft. have been exposed.

★ At the Rock Creek property between Wallace and Mullan, Hecla Mining Co.'s new prospect venture in the Coeur d'Alene district, the company has started a deep tunnel development to prospect a group of claims forming a block two miles square. This tunnel is 7 ft. by 9 ft. in the clear and is being pushed forward under contract at the average rate of 20 ft. per day. The tunnel will eventually reach a length of around 5,000 ft., a distance of 1,600 ft. having been accomplished since the first of the year. It will gain a depth of around 800 ft. on one vein system, an oxidized siderite outcrop from which assays of 50 oz. silver and 14.4% lead have been obtained; and more than 1,000 ft. on a shear zone some 50 ft. wide which carries galena ore assaying around 4% lead at the surface outcrop.

★ The U. S. Geological Survey and the U. S. Bureau of Mines announce they will use an airborne magnetometer instrument in their geological study of the Coeur d'Alene mining district silver belt, according to A. E. Weissenborn, Survey office, Spokane.

★ In the Day Mines, Inc., annual report for 1947, Henry L. Day, president and manager, says the company anticipated "a high rate of capital expenditure in the next few years, as

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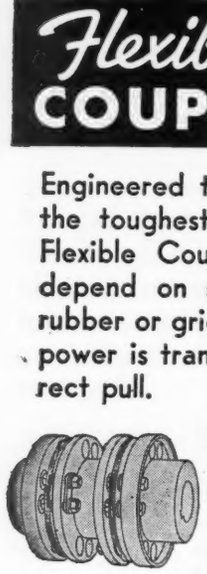

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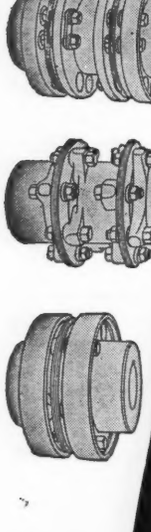

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OPEN-PIT PHOSPHATE MINING at the Simplot Fertilizer Co., Pocatello, Idaho.

Idaho (*Continued*)

several exploration projects are in the formative stage." He mentioned the unwatering of the company's old Hercules mine at Burke, and plans for further deep prospecting in that mine, together with the company's participation with the A.S.&R. company in sinking the Galena shaft in Lake Gulch.

The company has 569 men in its employ and during 1947 produced 220,912 tons of ore and treated 20,059 tons of tailings, which yielded 686,819 oz. of silver, 23,858,678 lb. of lead and 14,115,066 lb. of zinc. Total income of the company was $3,692,183; operating expenses, $2,287,891; leaving a profit before taxes and other deductions of $1,404,292.

★ Sunshine Mining Co. reports net earnings of $300,238.98 for the first quarter of 1948 and a total earned surplus of $4,726,814.60. The Silver Syndicate, half of which is owned by Sunshine, has been opened on the 3,700 level, 1,000 ft. below sea level, for a known vein length of 563 ft., practically all of which is in high-grade silver-lead ore. A crosscut from the Sunshine Jewell shaft to this vein on the 2,500 level, cut through 12 ft. of high grade ore, and stoping operations between these two levels, was expected to be under way in May. The Sunshine Consolidated property, in which Sunshine owns more than a 50% interest, expects to start on a steady output tonnage basis next month. This vein is on the western end of the Yankee Girl vein system. Three raises have been started on the orebody from the 3,100 level. Ore extracted in driving one raise a distance of 70 ft. returned the company $20,000. In addition to the preparatory work for production purposes, the company is driving the west drift on the vein towards Bunker Hill property.

★ Federal Mining & Smelting Co., acting as operating agent for the A.S.&R. and the Day Mines, Inc., is now down to the 1,100 level in the sinking of the Galena shaft on the Vulcan property near Wallace, after retimbering and enlarging 800 ft. of old shaft to four-compartment size and sinking 300 ft. of new shaft. Because the ground is difficult to hold, the company will change the shape of the shaft from here on down from four compartments in a straight line to four compartments forming a square. This will shorten the wall plates and otherwise strengthen the shaft timbers. The shaft will be sunk to 3,000 ft. From this horizon A.S.&R. will open the old Galena vein, and the Day company will drive a crosscut south to prospect the Fern group.

★ Hecla Mining Co. has declared its second quarterly dividend for the year 1948 at the rate of 25c. per share, amounting to $250,000. This brings Hecla's dividend record for the current year to $500,000.

★ The Clayton Silver mine in Custer County, Idaho, has produced ore worth $140,000 during the last three months at a net profit of $50,000, according to Norman Smith, geologist in charge of the operation.

★ The old Monolith gold mine at Shoup, idle for many years, is being reopened by the Gregor Mines, Inc. of Seattle, Wash., headed by George A. Meagher and Paul M. Sorenson.

★ Gateway Gold and Copper Co., Inc., expects to begin milling early in June at the Dewey open-cut gold mine, situated in central Idaho approximately 20 miles from the Yellow Pine mine, according to D. A. Campbell, president. Daily tonnage milled will be about 300 tons. Plant buildings have been completed and all major equipment has been hauled to the property.

Metallurgical tests have indicated that the gold is liberated at 20 mesh. Recovery by gravity methods is expected to be approximately 80%. Gold recovery is to be made by double-compartment jig in the ball-mill circuit and by corduroy tabling of the undersize from a vibrating screen in closed circuit with the ball mill. Jig and table concentrates will be treated with a pan amalgamator, and the amalgam will be retorted. Tailing losses seem to be 80% in the (—200) mesh which forms 35% of the tails and can be treated by cyanidation to raise the overall recovery to 94%.

The orebody consists of a wide silicified zone which follows a contact between a dark intrusive quartz porphyry and a flat-lying light colored rhyolite or tuff of undetermined thickness. Considerable free gold is found in fractures or seams. Erosion has removed overlying sediments from approximately 130,000 tons of this silicified zone. Crosscutting and drilling indicates another 150,000 tons of ore available with removal of sediments.

The Dewey mine was owned by the Barnsdall Oil Co. of Tulsa, Okla., which has held the property from 1902 until 1947. Ore valued at $265,000 was produced in 1902-07 with a grade of 0.25 oz. gold. In 1941-1942 the property was leased and 22,000 tons from an open cut across the orebody gave heads of $4.20 per ton. Before a plant could be erected Order L-208 halted gold mining.

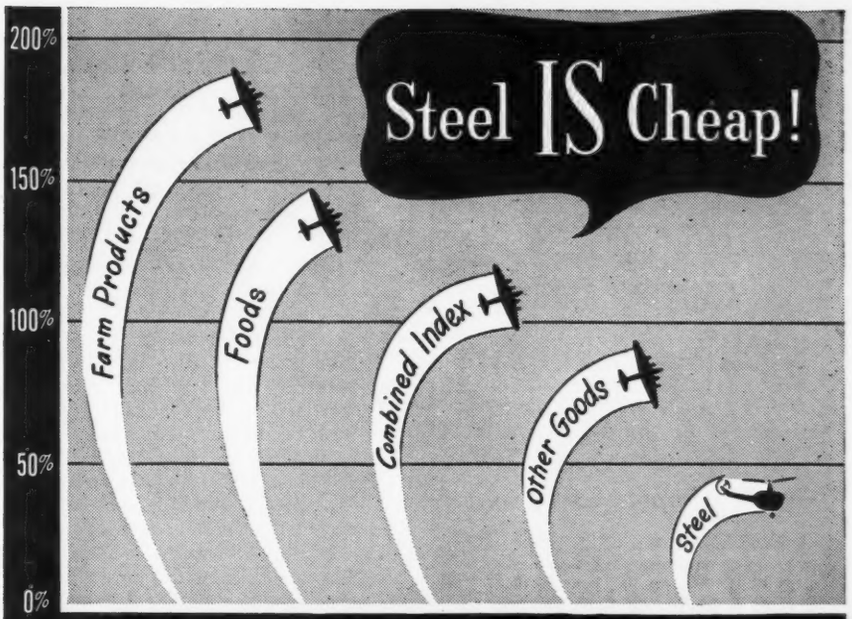
Because of the favorable soft character of the orebody the Gateway company hopes to keep overall costs below $1.50 per ton and will attempt to lower tailings losses below the 80c. per ton indicated. Howard C. Murphy is manager of the Dewey mine.

OREGON

★ A 700-ft. crosscut has been driven tapping the orebody about 500 ft. below surface at the Oregon Chrome mine, in Josephine County. Approximately 500 long tons are being shipped monthly to Tacoma.

★ Because of the requirement of resoiling in its contract for dredging on the Applegate River, the Stearns and Owens Dredging Co. is planning to change its operations from Josephine County to Fairbanks, Alaska, according to Charles Stearns.

★ Baker Dredging Co. has purchased the 72-bucket Sumpter Valley dredge which was reported to be capable of handling 280,000 cu. yd. of Sumpter ground per month.



NO ZOOM In Steel Price Rises!

U. S. Department of Commerce And Council of Economic Advisors Report Steel Price Increases Have Been Moderate

Recently the steel industry was again brought up to the whipping post. After a terrific tongue lashing, the Government set in motion three investigations to determine whether more punishment should be administered. The Department of Justice found no evidence of collusion.

The Department of Commerce reports steel price advances have been more moderate than in other lines.

The Council of Economic Advisors admits steel price increases have been less than those for manufactured articles, agricultural products, wages and material costs.

How moderate — how much less have been the increases in steel prices is shown in the chart above. It is based upon Government indexes of wholesale prices of various commodities as compared to steel mill products and shows the price increases from 1939 to February of 1948.

Comparison of steel prices to the prices of virtually any other components of the national income shows the irrefutable fact that the steel industry has held a taut line on steel prices and that the most wanted and most essential of metals — **Steel IS Cheap.**

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CALIFORNIA

Central Eureka's rehabilitation work progresses—Pioneer-Lilyama mines taken over by Morning Star

★ Directors of Central Eureka Mining Co. levied an additional assessment of 25c. a share on the company's capital stock, payable April 25. This is the eighth levy made in connection with rehabilitation of the gold properties at Sutter Creek, Amador County. Power curtailment caused by severe drought conditions has postponed the July production date but petition to the Public Utilities Commission of California for sufficient power to continue rehabilitation work has been favorably acted upon.

The mine has been unwatered and deepening of the Central Eureka shaft has progressed within 272 ft. of the 3,700-ft. station pocket, which level is close to the producing orebody. C. C. Prior, president, stated that rehabilitation costs are estimated at about $35,000 a month, with use of allowable power, and additional assessments will be necessary to complete the work and maintain the property until it can be placed in production. T. C. Slater, general superintendent, directs operations at Sutter Creek.

★ E. L. Oliver, president, Idaho Maryland Mines Corporation, reports that operating conditions at the company's gold properties in Grass Valley, Nevada County, have improved during 1947, and that current net earnings before depletion and depreciation are running at the rate of about $50,000 a month. Net income during 1947 before charges for depreciation, depletion, and amortization of patents was $53,903. All charges, including sawmill depreciation of $30,275, totaled $197,552, leaving a net loss for the year of $144,648.

Total ore production in 1947 was 213,605 tons (185,943 tons in 1946), of which 180,742 tons came from the Brunswick mine and 32,863 from the Idaho mine. Net value of bullion produced was $1,748,951, and metallurgical recovery averaged 93.78%. Of the 50,-112 oz. gold produced, 48,369 oz. were obtained from mine production, and the remainder from custom concentrates treated and cleanup operations. Total production of silver from all sources amounted to 13,507 oz. Labor shortage limited ore production. New mine development amounted to 14,052 ft., and recovered caved workings 2,345 linear ft. Diamond drilling during the year amounted to 1,573 ft. Further improvements in 1948 are expected, according to Neil O'Donnell, executive vice president and general manager.

★ Morning Star Mining Co., recently formed by O. H. Griggs and associates, has taken over the lease on Pioneer-Lilyama mines near Pilot Hill, El Dorado County, for joint operation with the old Buzzard mine situated about ten miles north of Folsom. The Pioneer-Lilyama properties have been operated by the Griggs interest for several years, and the 300-ton mill available is currently handling some 200 tons of gold-copper ore. Mr. Griggs is also operating the Alhambra gold mine near Kelso under lease.

★ Bralorne Mines, Ltd. of Vancouver, B. C., has taken an option on the old Goleta gold-silver-copper mine in an area tributary to Hawthorne and just over the Mineral County line in California. The property was an early-day producer of note, at one time supplying a 40-stamp mill. It was acquired for the company by Ira B. Joralemon, consulting engineer for Bralorne and president of Summit King Mines, Ltd., a Bralorne subsidiary that resumed mining and milling lately in Churchill County. It was announced that development and drilling would be undertaken shortly on Goleta ground. P. G. Dobson, manager for Summit King Mines, accompanied Mr. Joralemon to the mine.

NEVADA

Newmont starts construction of Goldfield Mill—Sodium products to be recovered in Churchill County

★ Consolidated Coppermines Corporation, operating at Kimberly, White Pine County, reported 1947 profits of $1,053,346, with dividends of $555,946 paid during the year. Chester D. Tripp, president, reported work on the Liberty open-pit copper orebody, operated jointly with the Nevada Mines Division, Kennecott Copper Corporation, will continue another two years on the current basis. At the end of 1947 about 36 million tons of overburden and ore had been removed from the pit and nearly as much more will be handled to complete the program.

★ Tonopah Mining Co. of Nevada has leased its Mizpah mine at Tonopah to Clyde Russell, mine and mill operator.

★ Newmont Mining Corporation was reported to have some 60 men employed in its Esmeralda Operation unit at Goldfield, where construction of a 100 to 120-ton mill has been started near the leased Florence shaft. Elmer Burt, superintendent, said there was no basis for late reports that rich gold ore had been exposed by a long crosscut being driven from the 350-ft. level station of the Florence shaft southwest to claims of the Goldfield Columbus Mining Co., reputed to be a Newmont unit and headed by John R. C. Mann, president of Empire Star Mines, Ltd., of Grass Valley, Calif., a Newmont subsidiary.

★ An aerial magnetometer survey of the Comstock lode and nearby Steamboat Springs areas in Storey and Was-

hoe Counties is to be conducted shortly by the U. S. Geological Survey, it was learned from the Washington office when Thomas B. Nolan, Director of the Survey, informed Senator Pat McCarran of the plan.

★ Miners employed by the Combined Metals Reduction Co. at Pioche, largest Nevada producer of lead and zinc, lately completed a 90-day period without a lost-time accident. As an award for the record the company had placed $400 at the disposal of an employees' committee to pay costs of a party for workers and their families and will add $200 for every 30-day period in which the record is extended. Over 300 men are employed.

★ A 50-ton concentrator, equipped with tables and jigs, has been completed at the Wall Canyon antimony mine in nothern Nye County by A. L. Brown and M. E. Niece of Tonopah, who report they have stockpiled some 300 tons of ore with high stibnite content.

★ Sodium products are to be recovered from the Soda Lakes in western Churchill County in a major-scale operation planned by James O. Greenan, mining engineer and operator of Reno. Test work continues and plant construction is expected to begin at an early date.

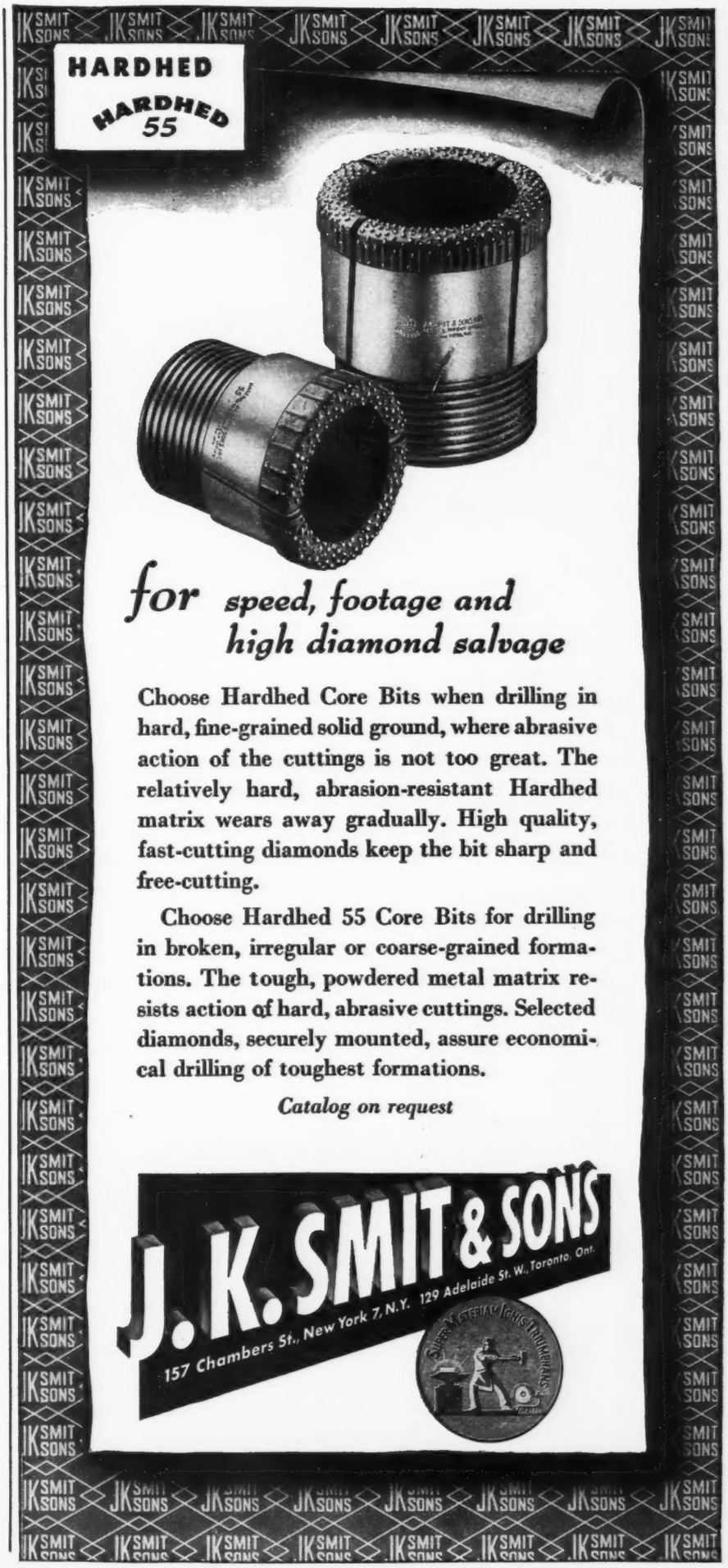
★ In his report for 1947, George Wingfield, president of Getchell Mine, Inc., says research and test work have continued in the company's and other laboratories and in the 100-ton pilot test plant housed in the cyanide mill structure, with the purpose of improving the process. Capacity of the cyanide plant has been increased from 1,000 tons to 1,500 tons per day.

MONTANA

Butte-Continental takes over Rampart Mountain properties—Plans announced for M.A.M. Summer Convention

★ At a recent meeting in Butte, the Montana Chamber of Commerce adopted a resolution "that the chromite deposits of south-central Montana—which were developed by the Defense Plant Corporation at an expenditure of between 15 and 20 million dollars, all of which program has been abandoned and the plants junked—should immediately be re-opened and put in productive operation; preferably under a price schedule which will permit private operation."

★ Western Montana Mine Owners & Operators Association held its annual meeting in Missoula on April 2, re-electing the following officers for 1948: Sidney M. Ward, Clinton, president; Mart Sullivan, Dixon, vice president, and A. J. Mosby, Missoula, secretary-treasurer.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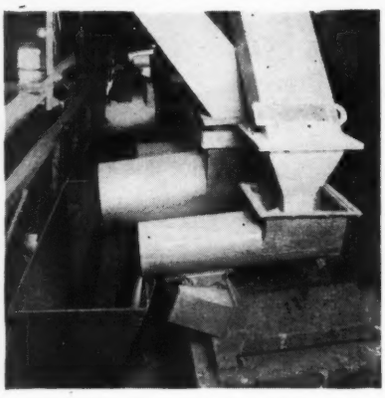

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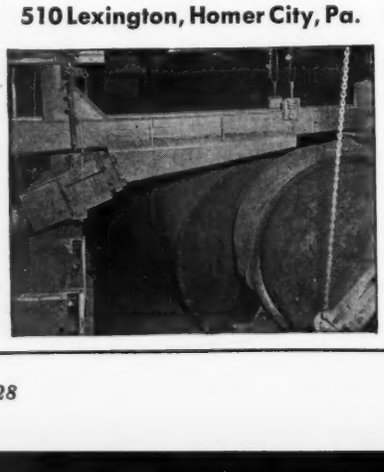

Montana (*Continued*)

★ E. S. McGlone, Butte, vice president in charge of western operations of the Anaconda Copper Mining Co., will be the banquet speaker at the Tenth Summer Convention of the Mining Association of Montana at Virginia City on July 31. The banquet will be held jointly by the association and the Montana, Columbia and Coeur d'Alene Sections of the AIME. H. G. Satterthwaite, chairman of the Montana Section, will be toastmaster.

★ Guests at the Tenth Summer Convention of the Mining Association of Montana will visit the tunnel workings of the U. S. Grant Mining Co., six miles south of Virginia City. During 1947 work was started on a 4300-ft. tunnel to tap gold-silver veins mined near the surface 30 years ago. The heading is temporarily stopped at 4,175 ft., and drifting has been started east and west on the main vein, which was cut at 4,030 ft. Diamond drill holes will be used to drain the old workings above the tunnel level. Work is under the supervision of W. H. Myers, president and general manager of the company.

★ It is reported that the properties of the Rampart Mountain Mining Co., east of Butte, shut down for many years, have been taken over by the Butte-Continental Mining Co., recently incorporated in Montana by Conrad Wolfle, Spokane; F. B. Winger and Frank L. McNulty, both of Butte.

COLORADO

Virginus company develops properties of Revenue Tunnel and Atlas—Anglo Saxon to resume

★ The Ibex Mining Co. of Leadville is operating its No. 2 and No. 4 shafts. Some work is being done by the company and some under lease to Wilson & Co. The company plans to open lower levels in its No. 4 shaft during 1948. Ores are shipped to the Leadville milling unit and Arkansas Valley smelter of the A.S.& R.

★ Lessees operating the Garibaldi tunnel at Leadville have installed an additional 600-ft. compressor, a mine locomotive, drilling machines and tractor. Some diamond drilling is being done and it is reported that the Leadville limestone has been encountered by drilling below the tunnel level. Since expiration of the Premium Price Plan, only the higher grade ores are being shipped. Tonnage for 1947 totaled 6,000. Operators expect to average about 300 tons of ore per month from the Sunday vein during 1948.

★ The Natomas Co. reported that the Colorado operations of South Platte Dredging Co., in which company Natomas has 50% interest, resulted in a loss of $70,317.67 for the eight months ended Dec. 31, 1947. This dredge is expected to show a better return in 1948, as it is now operating in richer ground.

★ The Virginus Mines Co. of Ouray is developing properties of Revenue Tunnel Mines Co. and the Atlas mine in the Mt. Sneffles district, through the Revenue tunnel, a crosscut 8,000 ft. long. The surface plant, snow sheds, boarding and bunk houses have been rebuilt and the Revenue tunnel and Virginus shaft reopened and electrified.

★ At Cripple Creek, Champion Mines reports the first carload shipment from the new strike in the W.P.H. mine settled for $50 per ton, the second shipment at around $30 per ton. The strike is reported holding out and values seem to improve as they raise on the new orebody.

★ The Gold Hill Mines Co. has operations under way at its Wonder tunnel group at Empire, according to W. W. Moore, president of the company. Ore shipped from veins cut by this 3,300-ft. tunnel averaged $25 per ton. Some assays ran as high as 9 oz. gold and 500 oz. silver per ton, with considerable lead.

★ Helicopter operations of the U. S. Geological Survey in the Paradox Valley area were completed by April 15, according to Robert O. Davis, Rocky Mountain district engineer for the survey. Topographical maps of about 500 sq. mi. have been made.

★ A strike of maintenance workers and shopmen halted operations of the Midland Terminal railroad, gold-ore hauling shortline between Colorado Springs and Cripple Creek. Gold ore from Victor and Cripple Creek is now being hauled to the Golden Cycle mill in Colorado Springs by trucks.

★ The American Zinc, Lead & Smelting Co. reported that its 1947 mining activity in Colorado consisted largely of exploratory development and the completion of a custom mill with capacity of 200 tons daily. The results of the development work, thus far, have not come up to expectations. All expenditures on mining, development and mill operations have been charged to current operations.

★ An ore shipment from the Melvina property of Front Range Mines, Inc., recently settled at $308 per ton, or $3,243 for the lot; another at $292 per ton, or $4,560 for the lot.

★ To take advantage of the high market on lead and copper, the Anglo Saxon mine, southeast of Georgetown, will resume work this summer under the management of Water V. Berry. Two diesel-electric units were put into operation there recently.

★ Plans for the construction of a gold ore reduction mill to be built in the Cripple Creek district have been considered for many years and are now

being pushed harder, due to the recent railroad strike on the Midland Terminal Railroad, according to Alfred Bebee, vice president and general manager of the Golden Cycle Corporation.

Bebee pointed out that the high cost of the operation of the corporation's Midland Terminal Railroad for the past several years has proven that the time has come when definite plans should be made to move the Golden Cycle mill from Colorado Springs to the Cripple Creek district where the ore is mined, thus eliminating hauling the bulk ore for a distance of 50 miles.

★ A milling venture which may mean a great deal to smaller mining operations is under way at the Garibaldi tunnel, three miles up California gulch. A portable mill has been set in cooperation with the American Cyanamid Co. of New York, agents for the patent owned by the American Lead, Zinc & Smelting Co.

The purpose of the tests is to make available lower grade ores of this district which have not been profitable in previous operations. The tests follow the work done by the Ore & Chemical Corporation at its plant recently in operation on dumps in this area.

★ Forty square miles in southwestern Colorado has been established as a reserve for the search of uranium deposits, at the request of the U. S. Atomic Energy Commission. Lands found to contain uranium will become available for development by private interests under lease with the Government.

At Grand Junction a number of uranium and vanadium producers have expressed dissatisfaction with the ore-purchasing program of the AEC, contending that the prices will not stimulate domestic production. Lessees in the Bear Creek area have again started operations on vanadium claims, shipping their ore to the Vanadium Corporation of America mill below Naturita. Production from the carnotite areas also is going to this mill; it is reported that the Vanadium company has offered a scale of payment for uranium in carnotite ore.

UTAH

MMSW continues to lose ground to PMC—Mineral rights go back to the Indians on 175,000 acres

★ The new 5-million-dollar Copperton industrial railroad line operating between the Bingham mines yard and Magna-Arthur mills went into operation May 1 with 3,300-hp. electric locomotives pulling 70-car trains. The new line is operated by the mills ore haulage department of Kennecott Copper Corp. The new electric locomotives are pulling 70 100-ton cars instead of 50 pulled by the steam locomotives. Speed also is considerably higher.

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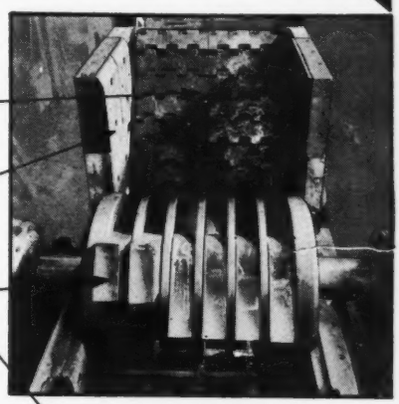

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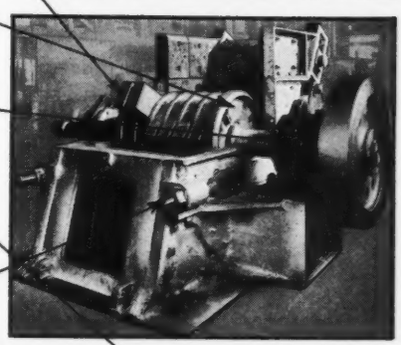

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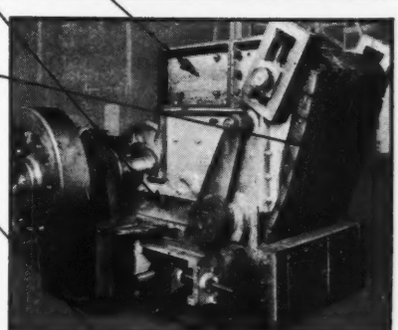

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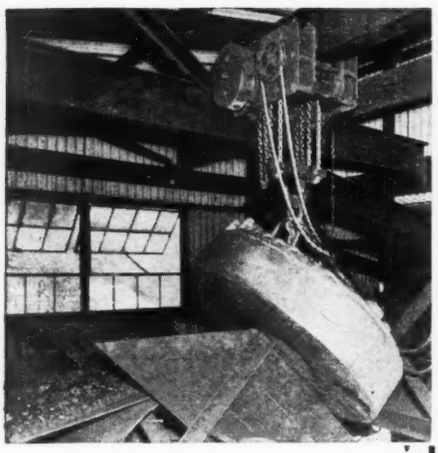

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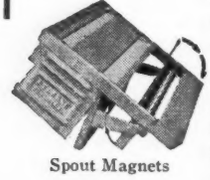

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COOLING TOWER OF THE REFRIGERATION SYSTEM now under construction at the Magma Copper Co., Superior, Ariz. Circular openings at the base are for axial-flow fans.

Utah *(Continued)*

★ The multi-million-dollar copper refinery to be built by Kennecott will be located immediately south of Garfield. According to tentative plans, the refinery will consist of eight buildings and will cover approximately 30 acres. The refinery will be the first copper refinery in Utah and will produce copper in commercial shapes ready for sale. Initial capacity will be 12,000 tons of finished copper a month.

★ International Union of Mine, Mill & Smelter Workers appeared to be losing ground rapidly in Utah early in May after all major mining operators had served notice on the union that while they would be glad to negotiate with their local unions, they did not care to meet with MMSW officials unless and until they signed non-Communist affidavits as specified by the Taft-Hartley Act. The operators terminated contracts with MMSW on ground that union officers had not signed non-Communist affidavits and because they were not sure who represented their employees.

Orville Larson, Globe, Ariz., international executive board member, asked members of negotiating committees of all Utah locals meeting May 4 in Salt Lake City to adopt a "no contract, no work" policy effective July 1. They declined to adopt such a resolution and reportedly served an ultimatum on officers to sign non-Communist affidavits or "get out".

Meanwhile, Progressive Metalworkers' Council, CIO affiliate whose officers have signed non-Communist affidavits, continued to grow at the expense of MMSW. Arthur Mullett, former organizer of United Office Workers and United Steelworkers and member of Lark local, MMSW, has been appointed Utah-Nevada staff representative for PMC to work with George J. Wilde.

★ Atty. Gen. Tom Clark, Washington, D. C., has given clearance for sale of the Kalunite plant in Salt Lake City to J. R. Simplot of Pocatello and Boise. Mr. Simplot has signed a contract with Dorr Engineering Co., New York City, to build a fertilizer plant costing from $1,500,000 to $2,000,000. The plant is to manufacture 80,000 tons of ammonium phosphate per year.

★ Mineral rights to 175,000 acres of land will pass to the Indians under provisions of an act adding some 430,000 acres to the Uintah and Ouray reservations, it was disclosed when an official copy of the act was received by the U. S. Bureau of Land Management, Salt Lake City.

★ Silver King Coalition Mines Co. reported for the first 1948 quarter net profit of $51,914, after all taxes and depreciation but before depletion. Net income for the year ended March 31 was $85,135. James Ivers is vice president and general manager.

ARIZONA

Phelps Dodge reports on production and capital expenditures—Magma Copper is completing million-dollar ventilation system

★ Two new test holes will be drilled by the San Pedro Mines Co. on its properties between Tiger and Mammoth, Arizona. According to an announcement made by John W. Daily, president, of Tucson, an earlier test hole will be drilled an additional 800 ft. to determine the sulphide zone and its values. The first test hole drilled on the San Pedro claims showed copper, gold, silver, lead, zinc, vanadium and molybdenite. At a depth of 1,475 ft. the oxide zone was reached and continued to a depth of 1,585 ft. The last 10 ft. was sampled and assays revealed the above metals. The core is also being tested for other rare minerals.

A test hole will be drilled on the Santa Maria claims in May and June, between the San Pedro test and the San Manuel development to determine the extension of the San Manuel deposit, which is second largest in Arizona.

★ The Ray mines of the Kennecott Copper Co. were closed down in early April because of a grievance involving 22 men. The strike threw 250 men out of work and involved a pay loss of $2,500 per day. The strike came at a time when the company began the conversion of its operations from underground to surface mining.

★ The Magma Copper Co. is spending more than 1 millon dollars for construction and installation of additional ventilation and air-conditioning systems at its mine near Superior. Refrigeration units consist of a compressor, condenser and cooler, each powered by a 200-hp. motor. High-speed fans are used to circulate hot mine air through cooling coils. Two lines are being installed, to carry cool water 4,800 ft. down, the other to return heated water to the surface.

Above the mine is a cooling tower about four stories high, where the heated water will be cooled and returned to refrigeration units at different mine levels. About 75 gallons per minute will be lost by evaporation, mine officials say. A pump house, between the tower and the shaft, will shelter large pumps which will circulate water in the system. Each of the new refrigeration units will cool 25,000 cu. ft. of air per minute, which will be piped to working miners through flexible tubes.

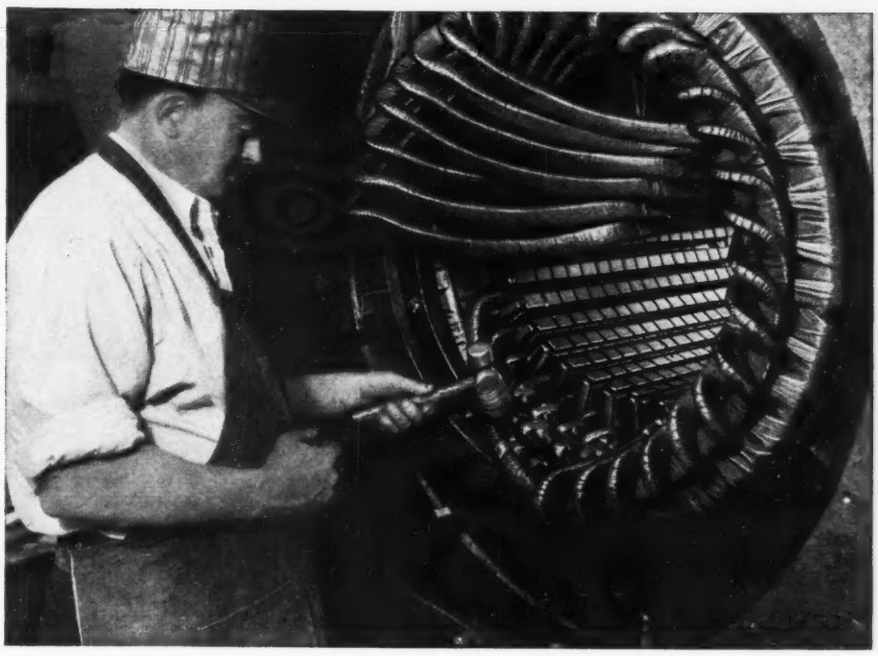
★ Kennecott Copper Co. will contest a State Tax Commission order levying an additional $60,000 assessment against the company's 1944 income. Basis of the controversy is whether money set aside to cover depletion of ore reserves is taxable income. Kent Lockwood, State income director, contends that it is. The anticipated Kennecott suit will test not only the validity of extra income tax assessments totaling more than $150,000 against that company for the years 1944-46, but also similar assessments aggregating in excess of 1 million dollars levied against other Arizona mining companies by the commission.

★ The Western Mining and Milling Co. has built a 75-ton flotation mill at its properties near Prescott. The mine has been under development about a year; ore carries values in zinc, copper, gold, and silver.

★ The Sunset Copper Co. expects to resume work at an early date on 17 lode claims northeast of Florence. The mine has been opened by a 600-ft. inclined shaft which will be sunk to contact the sulphide zone.

★ Ten tons of ore assaying 60% bismuth were shipped to Chicago early in April by Earl and Sidney Anderson, from mining operations near Wicken-

to help you beat motor heat!



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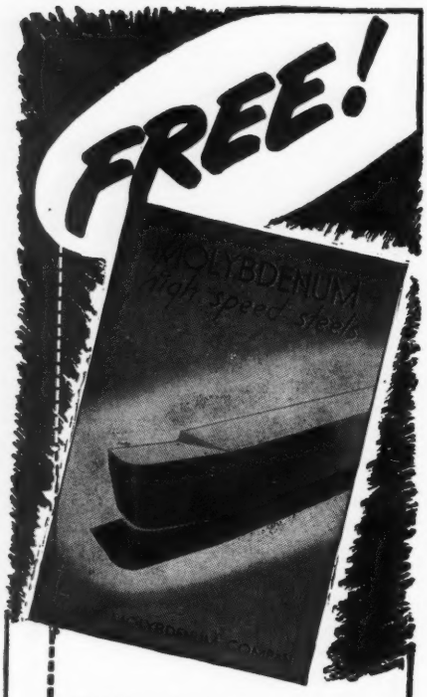

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Arizona *(Continued)*

burg and Morristown. The ore sold for approximately $14,000.

★ A recently released report shows that the Phelps Dodge Corporation stockholders total 28,186, holding 5,071,260 shares. The company employed 16,505 persons in 1947. Production of copper was 485,044,364 lb. for 1947. Capital expenditures in the last fiscal year amounted to $4,495,951.88, which included the acquisition of the Denn mining property and equipment at Bisbee from the Shattuck Denn Mining Corporation. Other outlays were for the construction of a lime-burning plant at Morenci, electrification and modernization of the hauling system in the open pit mine, and the enlargement of the power plant at Ajo.

★ In addition to the 5-million-dollar copper smelter to be built at Ajo, Phelps Dodge will construct 110 new homes for employees at a cost of an additional $700,000. The new development will increase to 12 million dollars the company's investment at Ajo since the improvement program started two years ago. Company officials say the population of the company owned mining camp will be increased from 6,000 to 7,000 persons.

The new smelter will be situated just east of the present concentrator, which processes 25,000 tons of ore daily from the Ajo pit, and will have a capacity of 10 million lb. of copper per month. In the past, ore from the Ajo district has been shipped to the Douglas smelter.

★ The Victoria Mines, Oatman, failed to cut the vein on the dip at 240 ft., as expected, but at 250 ft. they crosscut and found the vein had straightened out. Width of the vein is not known at this time. Ore values varied from less than one-half to 10 oz. of gold. Averages have not been determined. Mine officials believe that 60 ft. of drifting to the west will bring them under an ore shoot which shows on the surface.

★ The White Chief, Oatman, has drifted 200 ft. on its 200-ft. level. The ore continues the full length of the drift and is still exposed at the face. The vein is from 5 ft. to 8 ft. wide. Reports indicate that it averages 2 oz. in gold.

★ Robert G. Page, president of the Phelps Dodge Corporation, in testimony before the Public Lands Subcommittee investigating U. S. metal supplies, stated that operations at Jerome will continue two years instead of one, as previously announced, and that output could be increased by 5 million lb. a year by treating some low-grade ores at a copper price of around 30c. a pound.

Mr. Page told the subcommittee his company could develop another mine at Bisbee (presumably the old Calumet and Arizona properties) which could yield a substantial production but the cost would be prohibitive. He stated that the company expects to increase production at Ajo by approximately 10%, through expansion of concentrating facilities and the addition of mine equipment, "irrespective of any copper price."

NEW MEXICO

Ortiz Mine Grant being prospected —Warnock and Courtney properties reopened

★ The RFC has filed suit in Silver City asking foreclosure and sale of eight unpatented claims in the Steeple Rock mining district, under lease to the Exploration Syndicate of Salt Lake City. RFC loaned the syndicate $60,000 in 1942 and total indebtedness is now $98,000. Co-defendant in the suit is the Continental National Bank and Trust Company of Salt Lake City, trustee of the indenture and chattel mortgage security. This property was an early-day gold producer and has recently been developed for lead, zinc and fluorspar.

★ Ortiz Mine Grant, discovered in 1828 and under heavy exploitation spasmodically until the early 20th century, is being intensively prospected and considered for the values in the lower grade gravels and lodes. The grant includes most of the gold lode and placer area known as the Old Placers and the New Placers of Santa Fe County and embraces the Golden Placers and the Cunningham Mesa. The mineral rights of the Ortiz Mine Grant and the Golden Placers are under the management of G. R. Griswold, Albuquerque, assisted by Martin W. Pollock, Los Cerrillos.

★ Work of the Royal Flush Mining Co., which has seven claims in the Hansonberg mining district of the Oscura Mountains, has been centered on one claim where preparations have been made for a tunnel operation into the deposit. Principal ore constituents are galena, fluorite and barite. Owners are considering the possibilities of trucking the ore to the Blanchard Hanson mill at Hot Springs.

★ In the old Winston, Chloride and Apache mining district area, the Empire Mines & Metals Co. has employed men to clean and retimber the shaft at the Empire mine for preparation for a complete sampling job. Ernest Nichols and associates, of Deming, have built a road and are shipping ore to the El Paso smelter from the old Rifleshot mine. Robert Burnes and associates expect to resume work on their 100-ton mill at Grafton where they will treat the gold and silver ores of the Emporia and Ivanhoe and adjoining properties.

★ During the past year R. S. Casner and M. F. Drunger have conducted operations to reopen old workings on

the Courtney and Warnock properties in the High Rolls mining district and have shipped silicious lead and copper fluxing ores to the El Paso smelter. Forty-five cars were shipped from the Warnock mine, averaging approximately 6% Pb, .50% Cu. The mine is estimated to have developed tonnage of 70,000, averaging plus 6% Pb, with average width of ore beds ranging from 6 to 20 ft. The Courtney mine, once a producer of copper ores, is badly caved. All present production is coming from open-pit operations. Twelve cars have been shipped, averaging 2.67% to 3.56% Cu.

★ Officials of Rubber Asphalt Co., Los Angeles, including M. A. Bernhard, president, Joseph Thompson, production superintendent, and D. R. Samuels, engineer, will examine company mines in the Petaco district preparatory to erecting a mill. Plans are to produce wet and dry mica, as well as book and punch mica.

OKLAHOMA

★ Vermiculite associated with feldspar in a granite pegmatite dike has been noted in Kiowa County, the vermiculite appearing to be about one-fourth of the vein material. This material was found in two places in section 14, T.4N., R.17 W. and at another place about a half-mile southeast. Drill holes would be necessary to determine whether the dike is continuous.

★ An old prospect in northern McCurtain County is the site of recent open-cut operations for extracting manganese ore, by Thompson and W. T. Harrell. The mine is in section 33, T. 2 S., R. 26 E., and manganese minerals occur in fractured beds of novaculite.

TRI-STATE

Area awaits Congressional action on subsidies—New activities at Crestline and Picher

★ May 1 found the Tri-State mining industry still awaiting action by Congress on the highly controversial issue of subsidies for marginal mines. For nearly nine months, district producers have been robbing pillars, hitting bright spots and sludging drift bottoms to keep their mines going in the hope that Federal aid would be forthcoming or that the price would increase sufficiently to mine the marginal ores remaining in the Tri-State. Tailing plant operations have been practically at a standstill and some mines already have been abandoned.

On April 5 the price of pig lead was advanced $50 per ton and that of con-

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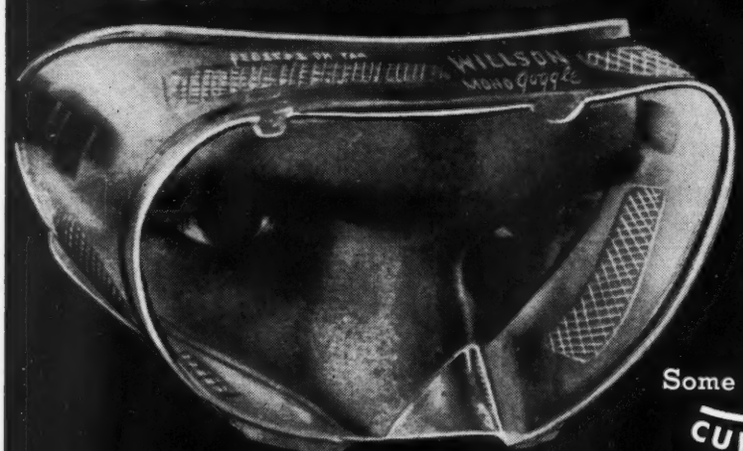

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Tri-State *(Continued)*

centrate in the local market moved up $36 per ton to $231.65 on a metal contract basis, the highest level in the history of Tri-State mining.

★ F. W. (Mike) Evans, of Joplin, widely-known Tri-State mine operator, has inaugurated an extensive pumping program in the old Crestline mining field, two miles east of Crestline, Kan. This field was opened up more than 25 years ago and mills were built on the R. O. Ellis, D. C. Williams and S. D. Newton tracts, and included those of the Sparks Mining Co., Andrews Mining Co. and Gaines Mining Co. The last mining operations of any consequence were those of the Eagle-Picher Mining & Smelting Co. about 17 years ago on the old Crutchfield lease. Evans has leased several thousand acres in the Crestline mining area. All water in the old mine workings will drain to the Ellis shaft as there is 19½ ft. difference in elevation, and it is estimated that 90 days will be required to dewater the entire area, with several pumps throwing a total of approximately 6,000 gallons a minute, Evans said. Once the ground is unwatered, the inflow is not expected to be great. It previously was handled by a six-inch triplex pump. Mining and prospect drilling in the area during the past showed a high percentage of lead values, in many instances exceeding those of zinc. The Crutchfield and Ellis shafts have been recribbed around the top. When the ground is unwatered, other shafts probably will be repaired and reopened preparatory to mining operations. Ore probably will be trucked to Evans' mill at Waco for treatment.

It is in the general area north of Crestline and northwest of the Waco field, bordering the Missouri-Kansas state line, that the Anaconda Copper Mining Co. is reported to be contemplating an extensive prospecting program, having reportedly taken rental option leases on some 50,000 acres.

★ F. & G. Mining Co. has opened a good zinc-lead mine on the old Kansas-Line lease on the Lindsey land, a mile northeast of Picher in Kansas, according to W. T. Graham and E. M. Fournier, who are managing the property. Mine operations presently are being carried on at a depth of 235 ft., but, as the orebody is pitching, the trend of the workings will be downward to the 275-ft. level. The company recently moved a derrick from the No. 7 mine of the M. & W. Mining Co. on the Oklahoma side of the state line to a new shaft put down during the last year. Ore, which has been dumped on the ground from a sinking derrick, is being trucked to the Lucky Jenny mill of the Harris Mining Co. at Hockerville for treatment. The company plans to open the old Kansas-Line mill shaft and expand operations. Others associated in the company are I. Schloe, A. Fisk, E. Joy, L. J. Burris and L. W. Joy, all of Los Angeles, Calif.

IRON COUNTRY

Safety awards to 21 Lake Superior iron mines—Stripping at Oliver's new Sherman mine

★ Twenty-one Lake Superior iron mines have been awarded certificates of honor for extraordinary achievements in safety by the Joseph A. Holmes Safety Association: Greenwood mine, Ishpeming, Mich., Inland Steel Co.; Canisteo district, Coleraine, Minn., Mountain Iron pit, Mt. Iron, Minn., Rouchleau pit, Virginia, Minn., and Soudan underground mine, Vermilion range, all operated by Oliver Iron Mining Co.; the Albany pit at Hibbing, Minn., Bennett pit, Keewatin, Biwabik pit at Biwabik, Mahoning pit at Hibbing, Scranton pit at Hibbing, Mahnomen pit at Ironton, Sagamore pit at Riverton, Volunteer mine at Palmer, Mich., Sunday Lake mine at Wakefield, Mich., Newport mine at Ironwood, Mich., and the Plymouth at Wakefield, Mich., all of Pickands, Mather & Co.; St. Paul and the Stevenson mines at Keewatin, Minn., Republic Steel Corp.; the Richmond mine at Palmer, Mich., M. A. Hanna Co.; and the Wheeling Steel Corporation's mines at Virginia and Eveleth.

★ At the auction bidding for leases on 6,100 acres of state lands between Crystal Falls and Iron River, held at Crystal Falls, Mich., April 16, five mining companies took up more than one-third of the lands offered. Pickands, Mather and Co., Inland Steel Co., M. A. Hanna Co., Republic Steel Corp., and Cleveland Cliffs Iron Co. paid a total of $1,750 bonus in addition to rentals. On some of the properties involved the state's ownership is a fractional undivided interest, not complete title. Under the Lindquist tax moratorium law on exploration lands, the operators will not be taxed on new discoveries for ten years, or until a property becomes an active mine within that time.

★ According to the annual report of Richard Johns, inspector of mines for Marquette County, Mich., seventeen mines and three quarries were worked during 1947. Operations centered around Negaunee and Ishpeming, all the mines being underground except the Volunteer, Richmond and Tilden open pits. Men employed underground totaled 2,149 and on surface 766, including 74 at the open pits. There were eight fatal accidents during the year. Operating companies were Cleveland Cliffs, Inland Steel, North Range, M. A. Hanna, and Pickands, Mather. Jones & Laughlin Ore Co. continued exploration on its lands south of Negaunee by core drilling and test pitting. Inter-State Iron Co. has discontinued pumping at the Mary Charlotte mine, which is now filling with water and transferring equipment to other properties.

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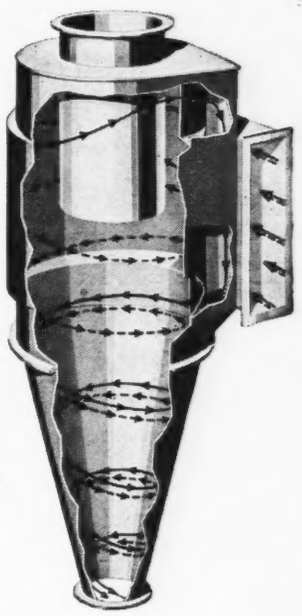

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Iron Country *(Continued)*

★ Unwatering of the old Champion mine shaft No. 6 on the Marquette range by North Range Mining Co. has now reached a depth of over 450 ft. Surveys are being made to locate the one mile of railroad track which will be required to reach the mine. A large Quonset hut is being used as office, warehouse and change house.

★ Inter-State Iron Co. is doing exploratory and check drilling at its Wentworth mine on the Mesabi range. While the tonnage is not large, it is of good grade and structure. Most of the ore will receive some form of beneficiation. The mine will probably begin shipping in 1950.

★ Butler Brothers expect 1948 shipments will amount to about 2,850,000 tons of which the Patrick plant will produce 1,000,000 and the Weggum at Hibbing 600,000 tons. The Hoadley plant is scheduled for about 80,000 tons. During the winter over 3,578,000 cu. yd. of stripping was moved, the South Agnew contributing 1,541,442 cu. yd., the Galbraith 991,177 cu. yd., and the Olson at Cooley 658,230 cu. yd. The remaining yardage came from other Butler Brothers properties.

★ The Minnesota Highway Department is making surveys for relocating about two miles of Highway No. 61 around Beaver Bay at the proposed site of Reserve Mining Co.'s 77-million dollar taconite beneficiation plant. The highway will be moved several hundred feet farther away from Lake Superior.

★ Oliver Iron Mining Co. is erecting a new washing plant just south of Mt. Iron, Minn., to serve the Mt. Iron mine.

★ Great Northern R. R. docks at Superior, Wis., reported a record tonnage for 1948, having moved 2,782,080 tons by April 30.

★ Oliver Iron Mining Co. is stripping off more than 3,400,000 cu. yd. of rock and surface waste material at the new Sherman mine in one of the largest single mine stripping operations scheduled for this year. South of the present Fraser mine in the city of Fraser, until recently this mine was known as the South Fraser. This year it became the Sherman mine in honor of Harry S. Sherman, former general superintendent of the Hibbing-Chisholm district.

★ At the Bristol mine of Inland Steel Co. at Crystal Falls pumping has proceeded to a depth of 360 ft. This is the limit of the first pump installed and it is being replaced with a second deep well unit with a capacity of 1,800 gpm. to a depth of 500 ft. The foundations are in for the new engine house and the two hoist drums have been set in place. Work is under way to clean up the second level.

★ The U. S. Geological Survey and the Minnesota State Geological Survey on May 1 will begin an air survey of 10,000 sq. mi. of seven northern Minnesota counties: St. Louis, Itasca, Koochiching, Mille Lacs, Kanabec, Pine and Aitkin. The plane will fly at about 1,000 ft. altitude carrying suspended magnetometer. Areas showing a high magnetic intensity will receive ground exploration by surveys and core drilling. Dr. G. M. Schwartz, professor of geology at the University of Minnesota, will direct the survey.

★ Officials of the Oliver Iron Mining Co. were hosts to about 50 representatives of newspapers and magazines in Duluth April 23. The visitors were shown through Oliver's new research laboratory and the plans for beneficiating taconite were explained to them. Walter L. Maxson, vice president in charge of research, said that a 34-million-dollar, long-range program is directed toward devising commercial concentration methods. A pilot plant is under construction at Mountain Iron and additional pilot plants are planned for Trout Lake, Coleraine, and elsewhere. The guests were taken on a tour of range mines the following day.

★ Twelve Great Lakes ore-carrying companies, tying their request into national defense, have asked the Government for financial aid in rebuilding and adding to the lake cargo fleet. During the war, owners received a "trade-in" allowance for old lake ships averaging about $60 per ton, between one-fourth and one-fifth the cost of a new ship.

The 18,000-ton ships built for the Lakes in wartime proved the need for new and bigger vessels. The big ones make about 38 trips a season, bringing down 550,000 tons of ore; smaller ones make between 27 and 30 trips and average only about 200,000 tons. There is little difference in daily operating costs of the large and small ships. Radar equipment installed on the new ships has enabled them to move on schedule in spite of weather conditions which held up the old vessels for several hours. However, as boats are built with a life expectancy of 30 years or more, fleet owners hesitate to invest 100% of the cost of new ships when there is some feeling that in 15 or 20 years the ore in the Lake Superior district may not be sufficient to keep a fleet of present size busy.

A. F. Weichel, Representative from Ohio and chairman of the House Maritime Committee, has been active in urging the shipping companies to make their request to the Maritime Commission, and in backing the arguments of the companies that new and more efficient ships are needed to supply the steel industry with sufficient ore. Aid was sought at this time in the hope of receiving consideration in connection with President Truman's request for an additional 100 million dollars. Ship owners were told that no money was available now for "trade-in" allowances and that their request would not be acted upon for some time.

MICHIGAN

Calumet & Hecla reclamation plant at Lake Linden reopened—Research includes agricultural projects

★ Since the beginning of operations in 1915, the reclamation plant of Calumet & Hecla Consolidated at Lake Linden has treated 36,351,000 tons of waste sands with a recovery of 407,038,000 lbs. of copper, at a profit in excess of 30 million dollars. Closed during the past winter, the plant has been reopened to treat the remaining tailings. Because in the early days of the mine and concentrator, the tailings were spilled out onto the ground or in shallow water at the shoreline and numerous docks and piers were erected on the site, the final scramming operations may cause irregular and intermittent operations of the plant. Remaining coarse sands are high in copper but contaminated by rubble and rubbish because of their proximity to the shore.

The company's copper hydrate plant was expected to operate at near capacity in May, and it is indicated that continuous operation may be justified. Several encouraging new commercial applications of copper hydrate have been developed, and interest renewed in copper soaps for mildew-proofing and wood preservation.

★ Calumet & Hecla's agricultural research program now includes 38 individual projects in Florida. Copper oxide is being extensively tested in plant feeding, both as a constituent of fertilizers and in nutritional sprays, on pasture grasses, cover crop, oranges, grapefruit, sugar cane, snap beans, escarolle, grains, potatoes, and celery. The results obtained on Florida plantings during the past winter will be carried into other states during the summer. Use of copper in various types of soils is currently recommended for certain crops by the agricultural experiment stations of Florida, Georgia, North Carolina, New York, Indiana, Wisconsin, New Jersey, Oregon, and Michigan.

★ Calumet & Hecla plans to test copper rock from its Michigan mine property near Rockland, Ontonagon County, with the hope of using float and sink methods. Officials believe that a concentrate can be made without too much loss in the tailings to enable some of the copper lodes in that area to be mined without having to build a local mill, or to ship low-grade ore the 60 miles to the Lake Linden mills.

★ Copper Range is employing a small force to mine in the East Vein above the 12th level in No. 4 Champion shaft. A number of stopes have been opened in favorable areas. The company's reclamation plant at Freda, which produced 338,390 lb. of copper last year, probably will be closed per-

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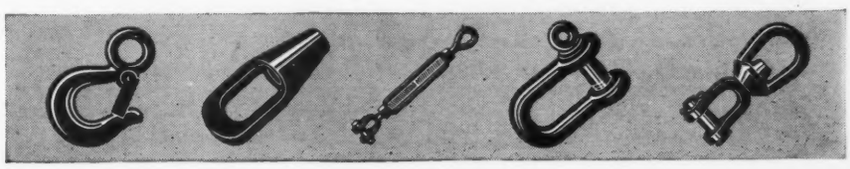

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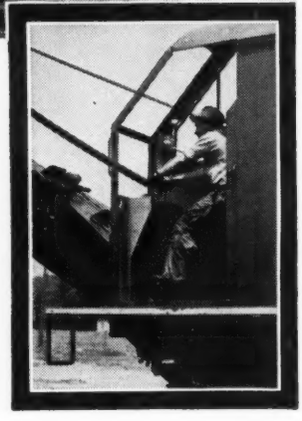

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Michigan (*Continued*)

manently because of the limited tonnage of sand available and increase in the cost of operation.

One of the chief assets of the Copper Range company is its timber lands. The tract of 71,325 acres, in Houghton, Keweenaw and Ontonagon Counties, is estimated to have approximately 270 million board ft. of sawtimber, exclusive of pulpwood and cedar products. The management has adopted a program of selective cutting, and the normal growth on these lands, it is believed, will more than make up for the harvested timber. An annual harvest of 6 million board ft. over the next 16 years is planned, in addition to a substantial cordage of pulpwood and cedar products.

★ At the annual meeting of Calumet & Hecla stockholders, president E. R. Lovell said that 1948 first quarter earnings were disappointing. He attributed this to a shortage of natural gas in January and February resulting in a three-weeks shutdown of the Wolverine Tube division at a cost of more than $250,000. Furnace trouble at the Calumet smelter affected output of refined copper, high cost of coal and other supplies. Drilling for zinc-lead in southwestern Wisconsin shows encouraging results. Both divisions of the company are operating at capacity.

NEW YORK

★ Following the discovery of indications of iron ore near Santa Clara in Franklin County, reported by Carl E. Guthe, director of the New York State Science Service, iron and steel companies having mining interests have been urged to investigate by Harold Keller, Commissioner of N. Y. State Department of Commerce. Mr. Keller speaks of two new deposits of iron ore, the magnetic indications of which have been mapped magnetically during the last two seasons. Magnetic maps of the area, it is promised, will be available shortly.

Production of iron ore in New York State in 1947 reached approximately 10 million tons, compared with 500,000 in 1938. The ore is chiefly magnetite. Operations are both open-pit and underground.

TENNESSEE

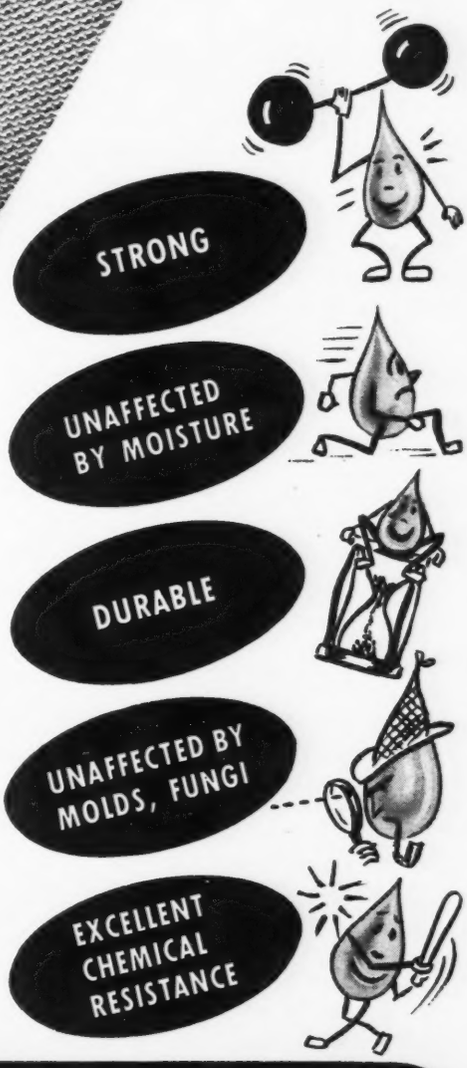
★ Prince Mining Co. of Mt. Pleasant has been mining phosphate in Giles County for several months. Recent production has been at the rate of six to eight carloads weekly, reportedly being shipped to the Victor Chemical Works at Mt. Pleasant. Ten men and six trucks are used in the operation.

ALASKA

U. S. Smelting operating dredges at Ester and Engineer, plans more—Geophysical institute to be constructed at University

★ The following list includes mining operations located in Alaska, some of which are not active this season:

District	Operator
Aniak	Marvel Creek Mining Co.
Bettles	Andy Schwaesdall
Bigelow Bench	Anderson & Breaed
Boundary	R. A. Brown
Canadian Border	Franklin Mining Co., Wade Dredging Co., Yukon Placer Mining Co.
Circle	Berry Dredge
Coal Creek	E. N. Patty
Colorado Creek	Goodnews Bay Mining Co.
Eagle	B. F. Hanson
Ester	Parker, Raymond & Hopkins
Fairbanks	Alder Creek Mining Co., Livengood Placers, Wolf Mining Co.
Flat	Awe Mining Co., Baquier & Turner, Hatton, Pete Miscovish & Sons, John Ogriz, Pat Savage, Harry Steen
Folger	Hard & Uotila
Goodnews Bay	Bristol Bay Mining Co.
Hot Springs	Pioneer Mining Co.
Hughes	Strandberg & Sons
Kantishna	Caribou Mines
Kuskokwin	W. H. Rose (Hard & Uotila)
Livengood	Fred Parker & Sons
Marshall	Johnson & Ostness
Medfra	Nixon Forks Mining Co.
Nyac	New York Alaska Gold Dredging Co.
Ophir	Matheson & Savagem, Rosander & Reed
Platinum	Goodnews Bay Mining Co.
Rampart	Little Minook Mining Co.
Ruby	Coyle & Rasmussen, Long Creek Mining Co.
Steese Highway	Strom Co.
Wiseman	Frank Miller
Woodchopper Creek	E. N. Patty



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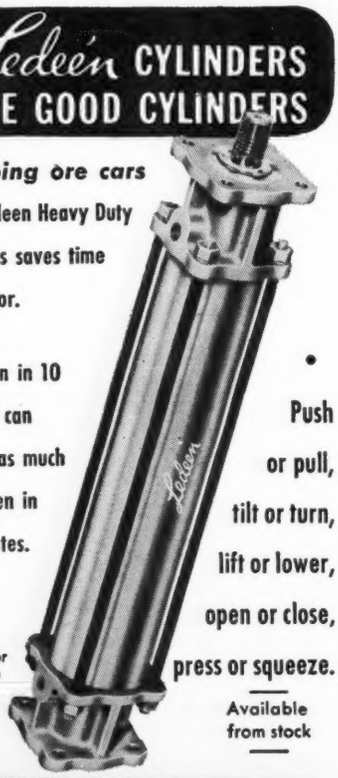

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Alaska *(Continued)*

★ Roy B. Earling, general manager for U. S. Smelting, Refining & Mining Co., reported seven camps open in late April, two dredges running at Ester and Engineer creeks, and plans for operating three or four more.

★ Big Four Mining Co.'s property on George Inlet, south of Ketchikan, has been reopened and shipment of lead-zinc ore will be made this season. Aner Erickson is in charge.

★ A geophysical institute will be constructed at the University of Alaska by the Public Building Administration. A hundred thousand dollars has been appropriated by Congress for the 1949 fiscal year. Work will include studies in meteorology, oceanography, terrestrial magnetism, atmospheric electricity, seismology and other sciences.

★ Polaris-Taku Mining Co. expects to employ over 200 men and to increase its concentrates to 12,000 tons, surpassing last year's record, which was the high for the company, according to Frank McPherson, manager.

CANADA

Consolidated reports 1947 income, development under way for 1948—Royalty and Tax Act passed in Manitoba

ONTARIO

★ According to Ontario Department of Mines production of gold bullion in the Province for the month of March, with 44 mines reporting, showed definite signs of improvement, rising to the highest figures recorded since May of 1947. Though average grade of ore treated was $8.59, the lowest since October, 1947, bullion containing 169,660 oz. of gold and 32,888 oz. of silver valued at $5,960,787 was produced during the month.

During the first quarter of 1948 the mines milled 1,969,179 tons of ore and recovered 486,979 oz. of gold and 101,840 oz. of silver for a value of $17,110,019. This represents increases over the same period of 1947 of 1.8% in tonnage milled, 1.82% for gold recovered, 61.54% for silver recovered and 1.93% for value. Employment figures for March, 1948, were reported at 12,766, against 12,540 in 1947.

MANITOBA

★ A "Mining Royalty and Tax Act" which imposes a royalty tax in respect to minerals and mineral products and a tax on mining claims was passed by the recently completed session of the Manitoba Legislature. The Act provides that the operator of each mine, excepting new mines, in the Province shall pay an annual royalty tax of 8% on the income derived from the operation of the mine in excess of $10,000. For a new mine the rate will be 6% for the first 12-month period of production, 7% for the second 12-month period and 8% thereafter. Deductible expenses include all working expenses as well as salaries; transportation and marketing costs attributable to the product; milling, smelting and beneficiating expenses; municipal taxes or contributions to municipalities in lieu of taxes; research expenditures; depreciation up to 15%, or if ore reserves justify a larger rate up to 30%; all exploration expenses within the Province; workmen's compensation costs and other contributions to the safety, welfare and health of employees. No allowance for depletion is made. However, all pre-production development costs, incurred in the development of the orebody from the date of acquiring the mine property to the date production from the mine begins, are permitted to become part of the operator's depreciable assets.

In addition to the above allowances, the operator may claim return of an amount equal to 8% of the original cost to him of the depreciable assets used in processing minerals containing precious metals. In the case of base metal mines this return shall not be less than 40% for nickel-copper producers, 30% for lead-zinc producers, 20% for copper-zinc producers, and 15% for all other producers of base metals.

★ Hudson Bay Mining and Smelting Co., Ltd., reports that an improvement in the labor supply during the latter part of 1947 permitted an increase in major development work. A considerable amount of main haulage drifting and crosscutting was done north and south of the south main shaft on the 3,000-, 3,250-, and 3,500-ft. levels. Development was also started on the 3,750-ft. level. The south main shaft was completed to a depth of 4,073 ft. A total of 14,146 ft. of stope development was completed during the year. Diamond-drilling totaled 67,057 ft. in 1947.

A total of 1,855,035 tons of ore was treated from which were produced 388,731 tons of copper concentrates averaging 0.283 oz. of gold, 3.76 oz. of silver per ton and 10.61% copper; and 132,310 tons of zinc concentrates averaging 0.05 oz. of gold, 1.39 oz. silver per ton, 0.68% copper and 45.0% zinc. The cyanide plant treated 1,252,164 tons of flotation tailings averaging 0.028 oz. of gold and 0.38 oz. silver per ton recovering 15,169 oz. of gold, 170,976 oz. of silver and 87,185 lb. of copper. The zinc plant treated 154,193 tons of concentrates averaging 0.0495 oz. of gold, 1.28 oz. of silver, 0.73% copper and 46.0% zinc from which 105,794,839 lb. of slab zinc were produced. There were also produced 61,861 tons of zinc plant residue. This production increased the residue stockpile to 700,000 tons. An addition to the zinc plant residue pilot plant is under con-

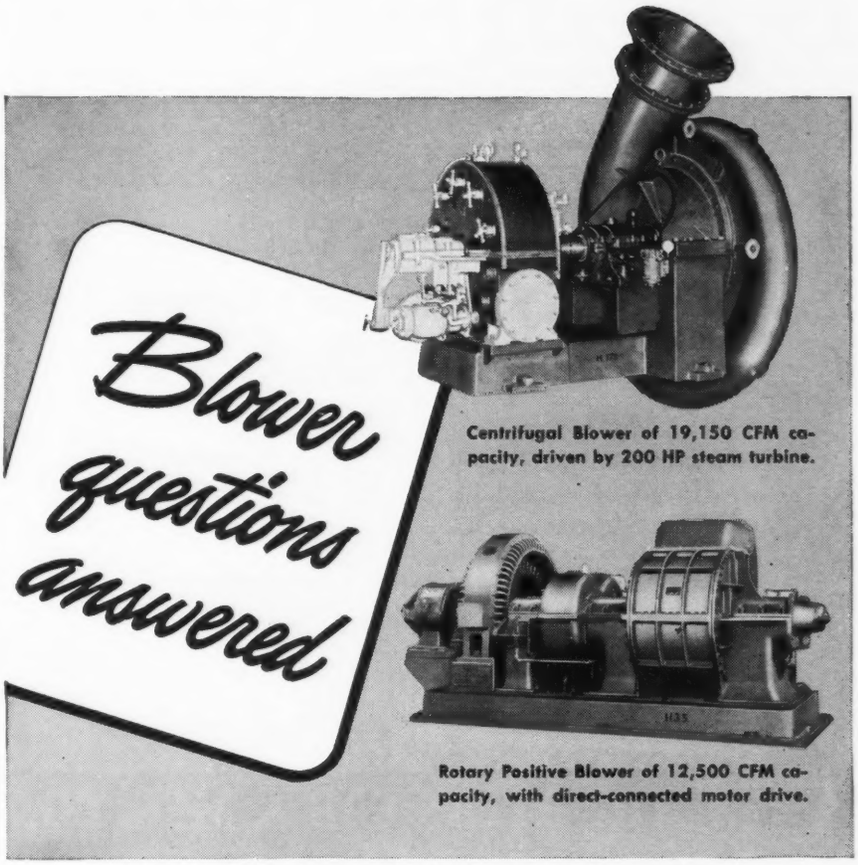
struction and larger scale tests will be carried out. A total of 445,109 tons of pay charge was treated by the copper smelter of which 412,901 tons were Hudson Bay concentrates and ore averaging 0.269 oz. of gold, 3.58 oz. of silver per ton and 10.7% copper. The company shipped for its own account 122,304 oz. of gold, 1,594,962 oz. of silver, 82,718,574 lb. of copper and 127,970 lb. of selenium. The cadmium plant produced 172,896 lb. of cadmium having an average purity of 99.98%.

★ At the Schist Lake mine, located about three and one-half miles southeast of Flin Flon, diamond drilling has proven ore to a depth of 600 ft. A three-compartment shaft is now being sunk to permit underground development and exploratory diamond drilling is continuing. The ore thus far developed is included in Hudson Bay's report of 22,700,000 tons of ore reserves.

★ The report of Cyprus Mines, Ltd., for 1947 (in which Hudson Bay holds a 79% interest) discloses active development during the year. The main shaft was continued to a depth of 830 ft. An auxiliary shaft, 1,000 ft. south, was sunk to the 125-ft. level in order to open up the upper portion of the mine for stoping. A total of 2,860 ft. of drifting was completed on the 125-, 250-, 400-, 500-, 600-, 700- and 800-ft. levels and 5,240 ft. of underground diamond drilling was done to outline the orebodies. The property will be equipped for production of 300 tons per day. It is expected that production will commence in the latter part of 1948. An agreement has been reached with Hudson Bay Mining and Smelting Co., Ltd., in regard to finances and the purchase of the copper and zinc concentrates produced. Ore reserves at the year end are estimated at 280,000 tons averaging 0.049 oz. of gold, 0.99 oz. of silver per ton, 3.87% copper and 7.3% zinc.

BRITISH COLUMBIA

★ When the major development program of Consolidated Mining and Smelting Co. of Canada, Ltd., including the installation of all primary crushing equipment underground, the driving of a new main-haulage entry for 10,200 ft. and construction of two miles of surface railway, and installation of "sink-float" equipment at the mill, is concluded the Sullivan concentrator is expected to have a capacity of 12,000 tons daily. Other major projects to be completed during 1948 are the deepening of the No. 1 shaft to the 2,750-ft. level and the installation of a new hoist at the Sullivan mine, construction of a second slag-fuming furnace in the lead smelter at Trail to make possible the treatment of a large accumulation of zinc-plant residue, and the installation of new electric boiler equipment at Warfield to effect economies in the use of coal.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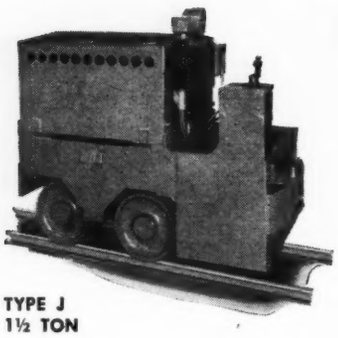

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British Columbia (*Continued*)

★ During 1947, Consolidated's income from sales of products was $100,580,455. Net profit was $37,278,341 after providing for income and excess profits taxes, depreciation of plants, depletion of mineral properties, and payment to the Pension Fund Society on account of past services of employees. Dividends during the year totaled $26,207,219. Production from the Sullivan mine was 2,252,729 tons. Ore reserves were increased about 2,500,000 tons over those estimated at the close of the previous year, with an estimated increase of 80,000 tons in metal content. Development work totaled 46,739 ft.

★ Customs ore treated at the Trail smelter totaled 27,504 tons, for which a net value of $1,604,565 was delivered to 66 shippers.

★ Polaris-Taku Mining Co., Ltd., is considering the installation of additional flotation equipment and thickeners to recover the antimonial content of the ore. In the past, penalties aggregating as much as $6,000 annually have been charged by the Tacoma smelter for the percentage of this metal in the gold concentrate shipped.

★ Drilling done by Torbrit Silver Mines, Ltd., from the winze crosscut in the Toric mine, Portland Canal district, has indicated important additions to previously known orebodies. Cores recovered from a number of holes drilled downward have indicated extensive additions grading from 10 to 80 oz. silver per ton. Good progress is reported in the construction of the mine camp and 300-ton mill. Torbrit is a subsidiary of the Mining Corporation of Canada, Ltd.

★ Summit Mines, Ltd., recently incorporated in British Columbia, plans to commence dredging on Pine and Antler Creeks in the Caribou district early in May. The company is entirely financed by Larsen and Harms, dredging operators of Sacramento, California. Testing during 1947 indicated immediate reserves of 2 million cu. yd. assaying 70c. per cu. yd. Included in a shipment of 13 carloads of machinery and equipment recently reaching the property was a 3-cu. yd. Marion dragline dredge. The mine-office address is Quesnel, B. C.; R. H. Wallace is general manager and Eugene Krouse is dredging superintendent.

★ The 50-ton mill, now under construction by Silver Standard Mines, Ltd., Hazelton, B. C., is expected to be in operation in July of this year. Ridgeway W. Wilson, managing director, has estimated proven and probable ore at 52,987 tons with values in gold, silver, lead and zinc.

★ Dredging was to commence in May by Moccasin Mines, Ltd., on McDame Creek in north central British Columbia. The company, financed by Larsen and Harms of Sacramento, Calif., holds 18 miles of leases on French

Creek, 12 miles on McDame Creek, and 7 miles on Spring Creek. To provide access to the property, 70 miles of new road were constructed from mill 647 on the Alaska Highway at a cost of more than $200,000. During the winter 23 carloads of machinery and supplies, including a 5-cu. yd. Bucyrus Erie walking dragline dredge, were transported via Skagway, Alaska, Whitehorse, Y. T., and the Alaska Highway to the site.

★ The Granby Consolidated Mining, Smelting and Power Co., Ltd., earned a net profit of $475,850 from its operations at Copper Mountain and Allenby during 1947. Production consisted of 21,323,366 lb. copper valued at $4,623,623 and 5,141 oz. gold and 149,497 oz. silver valued at $309,185, from 1,333,474 tons, averaging 0.987% copper. Development work at the Copper Mountain mine consisted of 4,080 ft. of driving and crosscutting, 7,444 ft. of raising, and 3,049 ft. of exploratory diamond drilling. Reserves were estimated, as of December 31, at 9,042,000 tons of ore grading between 1.2% and 1.3% copper.

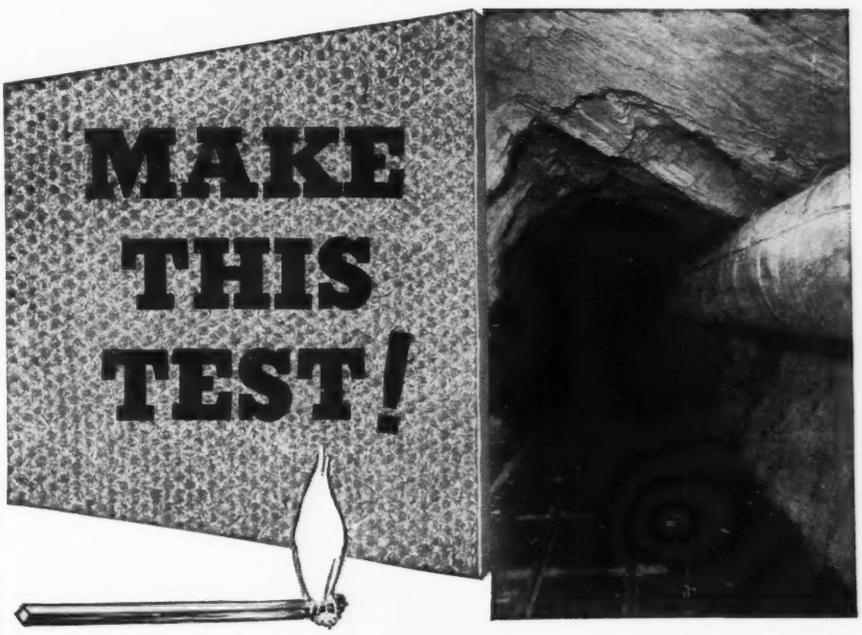
★ Highland-Bell, Ltd., Beaverdell, shipped 5,136 wet tons of ore to the Trail smelter during 1947. The shipments yielded 605,705 oz. silver, 203 oz. gold, 312,333 lb. lead, and 411,112 lb. zinc valued at $458,367. After provision for depreciation and taxes, net profit for the year was $153,685.

★ The construction of a 200-ton mill at the silver-lead property of Silver Giant Mines, Ltd., Spillimacheen, B. C., has been recommended by Alfred R. Allen, consulting geologist, who estimates there is 90,000 tons of ore in one block grading $32 per ton and 84,000 tons in another grading $24 per ton. Further, he states there is an indicated tonnage of 610,000 tons to the 2,900-ft. horizon, 1,000 ft. below the outcrop.

★ Diamond drilling in the Kicking Horse and Monarch mines at Field, B. C., by Base Metals Mining Corporation, Ltd., has been encouraging. One intersection 63 ft. in length carried values of 36% lead and 24% zinc. Production for April was the largest for several years. The company ships its concentrates to the Trail smelter.

YUKON TERRITORY

★ Interest continues to center in the Firth River gold strike in the extreme northeastern corner of the Territory. Five well-known Dawson prospectors recently flew to the area, landing just beyond the barren lands where there was some available timber. So far this season only three planes have landed in the discovery section, two from Dawson and one from Fairbanks. There are a number of prospectors, including four who were original stakers, in Aklavik, N.W.T., awaiting airplane transportation to the scene. Since the close of last season nearly 200 claims have been staked, mostly



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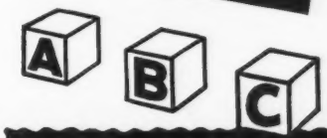

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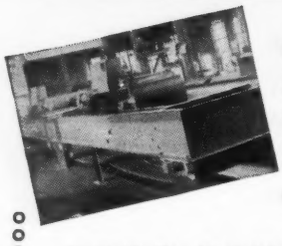

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Yukon *(Continued)*

by Esquimeaux from Aklavik and Herschel Island. Lon Philpott of Fairbanks, Alaska, now holds from 35 to 40 claims and at last report was planning to ship in machinery to work the ground. The Firth River district has been described as a rugged, desolate country, almost continually lashed by high winds, and one in which a prospector or miner must have many hardships and handicaps. However, the discoveries reported are very rich and many hold hope the strike may lead to a major gold rush.

COLOMBIA

★ Late in 1947, the Colombian press launched a campaign against the Banco de la Republica (official bank of issue where miners were obliged by law to sell their gold) for its insistency in selling the gold to the United States, where the price has remained at US$35 per troy ounce. This price, the press clamored, was too low. The Colombian Congress passed a law in December creating the so-called "Gold Certificates," which may be sold by miners in the free market at prices higher than those which the Bank had been paying.

In spite of the new "Gold Certificate Law," which is supposed to permit miners to sell their gold at international market prices (US$70 per troy ounce, except in the U. S.), Colombian gold production has continued to decrease in comparison to previous years. One of the reasons for this is that the miners have come against official restrictions and difficulties in trading their Certificates and, therefore, the actual benefit of the new law has been little or none. If the official red-tape involved in the negotiation of the Gold Certificates is not eased, miners predict that production will continue to go down.

According to official statistics, gold production in Colombia was 437,176 troy oz. in 1946 and 388,736 troy oz. in 1947. The greatest decrease took place in the second half of 1947 when production dropped from 21,772 oz. in July to 19,621 oz. in Dec.

PERU

Hydroelectric plant on Santa River to power zinc plant—Lead and zinc values at Los Andes mine

★ The erection of a large hydroelectric plant on the Santa River, at Huallanca, some 100 miles inland from Chimbote, is progressing quite rapidly. The final project calls for the installation of a 125,000 kw. plant, but at present only two turbines, of 25,000 kw. each, will be installed. These turbines have already arrived. The main tunnel, which will carry the water to the turbines, will have a total length of 9,700 meters; some 5,000 meters have been done, and it is expected that at the present rate of 250 meters per month, the tunnel will be finished by the end of 1949.

This hydroelectric project, in care of the Corporación Peruana del Santa, has been undertaken with a view to the development of the rich anthracite mines of the Santa Valley, and the erection of an electrolytic zinc plant in Chimbote. This plant will enable Peru to export electrolytic zinc instead of zinc concentrates. In 1947, the production of zinc concentrates was 79,597 tons, averaging 59.8% zinc; average grade of the ores was 8.69, plus values in silver and lead. One of the important products of the zinc plant will be fertilizer, made from the sulphuric acid in combination with the Santa anthracite. The ultimate goal of the Santa project is the establishment in Chimbote of a small steel plant.

★ The Atacocha mine, located near Cerro de Pasco, and one of the largest lead and zinc mines in Peru, plans to increase its production of zinc concentrates from the present 1,600 tons per month to 5,000 tons per month.

★ The Los Andes mine, in the region of Huachocolpa, inland from Pisco, has struck a contact zone between the andesite and limestone, which carries high values in lead and zinc. This contact zone has not as yet been properly prospected.

CHILE

Anaconda will examine Manto Verde mines — Stocks accumulate at Caja de Crédito mills as ore production increases

★ Favorable schedules for gold, copper and lead offered by Caja de Crédito Minero has increased production of cyaniding and concentrating ores to such an extent that the stocks accumulated at the Caja's mills are sufficient now to keep them running at full capacity until the end of the year. Now the problem for the Miner's Bank is that of financing the buying until the ores can be converted into metallic gold or concentrates and turned into cash.

The Mining Bank has decided to increase capacity of its cyanide mills to take care of increasing stocks and prevent a possible loss if the price of gold falls below the present high level.

★ Two Anaconda geologists are carrying out a systematic examination of all likely deposits of interests in the country. Recently, they were examining mines south of Santiago but have now returned to the north to complete the work begun there some time ago.

Anaconda has an option in the well known copper mines of Manto Verde in the Chañaral district, a distinct copper belt which extends from the port of Chañaral to Potrerillos in the Andes mountains. It is said that soon drilling will begin at Manto Verde. The examinations include copper, lead and gold mines.

★ Corporación de Fomento (Chilean RFC) has practically put an end to its interest in metal mining proper except that connected with the development of the oil fields in Magellan Province, the steel industry at San Vicente Bay and the development of zinc mines and a zinc electrolytic refinery to be built later on. The Government wants to entrust the development of metal mining to the Caja de Crédito Minero.

★ The demand for Chilean gold coins, the old ten Condores pieces containing 18.3 grammes of fine gold (0.586 oz.) which are auctioned daily at the Santiago and Valparaiso Stock Exchanges, has increased so sharply that their price has gone up during April to $106 an ounce.

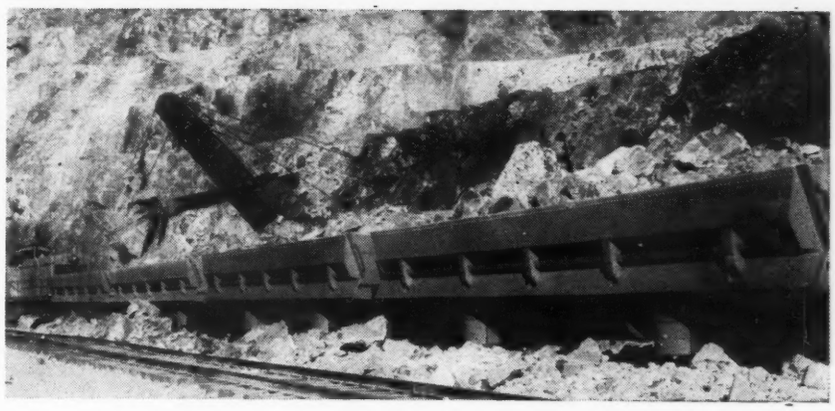
★ Reinforcing steel, rails and machinery will soon begin to arrive in Chile for construction of the Paipote copper smelter being built by Caja de Crédito Minero. Most of the materials to be bought in the country, such as timber, cement and piping, are already on the job. The temporary warehouses and part of the temporary camps to house the workers are built and the water-wells sunk.

★ The Sierra de Zapallar mining district northeast of Copiapó in Atacama, where there are numerous, wide, low-grade lead-gold-copper veins, is being developed by Oscar Flores, a Chilean mining engineer.

★ The ousting of Communists from the Chilean coal mines is paying good dividends in the form of record productions from most of the mines, especially from the large pits of the Lota and Schwager companies. Comparable results are being obtained from the nitrate and copper mines. The ousted Communists are being sent to locations where they can do no harm to production, but the Government is keeping a sharp lookout for sabotage work.

★ Due to the good offices of the President of the Republic, a likely strike was averted at the Torfo iron mine belonging to Bethlehem Chile Iron Mines, which employs about 500 men and exploits an average of 1,700,000 tons of 60% iron ore a year which is shipped to Sparrows Point. Relations between this company and its workers have always been good in Chile.

★ Because of the successful arbitration of the Secretary of the Treasury, Engineer Señor Jorge Alessandri, Braden Copper and its unions came to an agreement whereby the men obtained increases in their wage proportionate to the rise in cost of living. Braden has in operation a sliding wage



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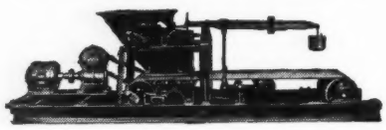

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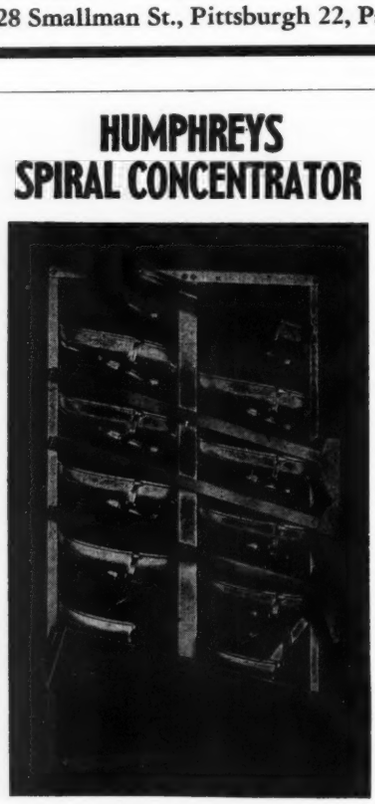

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Chile *(Continued)*

scale which moves with the fluctuations in the cost of living as determined by Government statistics. As a special incentive, workers will get an extra day's wages if they put in six days' complete shifts per week.

★ Caja de Crédito Minero will spend about $3,600,000 in building the Paipote Copper Smelter this year. In this amount are included part payments for machinery and steel to Allis-Chalmers.

★ According to the geologists and engineers from the Mining Institute for Antofagasta, exploratory work made by them along the route of the recently completed railroad from the Chilean port of Antofagasta to the Argentine town of Salta has given favorable results showing the occurrence of mineral deposits of gold, sulphur, silver and manganese. The new railroad will permit the working of some of these deposits.

ARGENTINA

★ The President has authorized the Dirección General de Fabricaciones Militares to call bids for the installation and management of a tin smelter for Bolivian and domestic concentrates. The commercial treaty signed by Bolivia and Argentina last year provides for the importation of 8,000 tons of fine tin annually during the next five years.

★ Many facilities have been granted to tungsten carbide producers in the country in order to encourage the industry. Machinery and materials not obtainable in the country will be liberated of import duties; carbide exports will be accorded preferential exchange permissions after the internal needs are satisfied.

★ Sominar S. A. (Sociedad Minera Argentina) has resumed the exploitation of Los Condores mine near Concarán, San Luis. Tungsten and bismuth concentrates are produced again on a small scale.

AUSTRALIA

Expansion of zinc industry under way throughout Dominion—Bulolo rehabilitation progresses at New Guinea

★ Early expansion in the Australian zinc industry is anticipated, with the Zinc Corporation, Ltd., and New Broken Hill Consolidated, Ltd., which operate lead-zinc mines at Broken Hill, New South Wales, acting in conjunction with Imperial Smelting Corporation, Ltd., of England, to secure greater production of zinc metal. The proposed operations will cover the production, fabrication, and commercial use of zinc metal, as well as the production of sulphuric acid from the roasting of zinc concentrate, for use in the fertilizer and chemical industries.

★ Zinc output in Australia is expected to rise to the pre-1943 average of 230,000 tons per year, influenced heavily by increased production from Mount Isa Mines, Ltd., Queensland. Present Australian production is 170,000 tons per year, of which 80,000 tons is in the form of electrolytic zinc from the works of Electrolytic Zinc Co. of Australasia, Ltd., at Risdon, Tasmania, the concentrate being obtained from the Broken Hill mines, in New South Wales, and the Read-Rosebery mines in Tasmania. These works have a total capacity of 96,000 tons of electrolytic zinc, so that the increased production by Mount Isa will make available about 150,000 tons of concentrate for export.

★ Comparative figures for the Commonwealth's gold production show that the output in 1939 was 1,645,697 fine oz., falling to 656,867 oz. in 1944, and rising to 937,359 fine oz. in 1947. The chief reason for the decline in labor in the gold industry is the huge growth of government departments. These departments have absorbed labor which would, otherwise, have been productively employed in rapidly expanding gold mining industry.

WESTERN AUSTRALIA

★ North Kalgurli (1912), Ltd., reports ore reserves totaling 1,548,385 tons, comprising 1,116,915 tons of positive ore with an assay value of 6.21 dwt. gold per ton, and 431,470 tons of probable ore assaying 5.54 dwt. gold per ton. Output of ore per annum has approximated 150,000 tons, and for the year just ended, production of gold was 44,715 fine oz., the average grade being 5.86 dwt. per ton.

★ The Mountain View mine at Cue, where during the war rich ore was met and gold to the value of some £A250,000 won to a depth of 350 ft., has recently been taken over by new interests, and exploratory work continued. The shoot, 40 ft. by 12 ft., has been exposed at the 470-ft. level, where two other lenses have been exposed, all carrying free gold. A winze being sunk on the shoot has now reached the 520-ft. horizon, and shows good ore. Further exploratory work is proceeding at the 270 and 370-ft. levels, with encouraging results. The Mountain View mine is on the northern extension of the lode channel which contained the once famous Great Fingall orebody, which was worked to a depth of 2,500 ft.

TASMANIA

★ Mount Lyell Mining and Railway Co., Ltd., at Queenstown, reported, as the result of an extensive diamond

drilling program, ore reserves have been increased to 35,000,000 tons, most of which is workable by open cut. The average assay value is 0.77% copper. Last year's production was 1,820,000 tons of open cut material, of which 447,000 tons was waste.

The last quarterly report shows that ore milled totaled 347,144 tons, from which 6,961 tons of concentrate was recovered. Production was 1,834 tons of blister copper, containing 1,820 tons copper, 7,177 oz. silver and 1,325 oz. gold.

★ North Broken Hill, Ltd., and Broken Hill South, Ltd., are still engaged in exploratory work on the Zeehan silver-lead-zinc field, on the west coast of the Island. Extensive geological and geophysical work has been carried out, followed by 10,000 ft. of diamond drilling. The lode types include pyrite-cassiterite, magnetite-pyrite-chalcopyrite-sphalerite-galena, pyrite-blende-galena, pyrite-galena, siderite-galena, pyrite-stannite-chalcopyrite, and pyrite-stannite-galena. The siderite-galena type has been the most important economically. The siderite is manganiferous and the galena is argentiferous, tetrahedrite and bournonite also contributing to the silver content of the ore. The proportion of silver was usually 1 oz. per unit of lead, or less.

★ King Island Scheelite, N. L., which works a very large occurrence of scheelite on King Island, has reported a successful year. The deposit, probably the largest in the world, is worked by open cut, and during the war was equipped with a milling plant of 20,000 tons per month capacity. Production for the year was 128,628 tons of ore and 113,441 tons of overburden and waste. The assay value of the ore was 0.652% WO_3; concentrate produced totaled 613 tons with an average assay value of 64.7% WO_3.

SOUTH AUSTRALIA

★ Broken Hill Associated Smelters Pty., Ltd., at Port Pirie, has carried out extensive research into the treatment, for the recovery of zinc, of the slag dumps at the lead smelter. The dumps contain 5,500,000 tons of slag, with the zinc content value estimated at £A20,000,000. The initiation of the scheme depends upon the supply of cheap power, and development will be influenced mainly by delivery of machinery for the power undertaking.

NEW GUINEA

★ Bulolo Gold Dredging, Ltd., is making good progress with rehabilitation of the dredges and resumption of production, following wartime destruction. Two dredges were put into commission by May 31, 1947; two more by Sept. 12, and a fifth commenced work early this year. Three remain to be rehabilitated. The 4,000-ton, deep digging dredge, which was partly submerged, has been successfully re-

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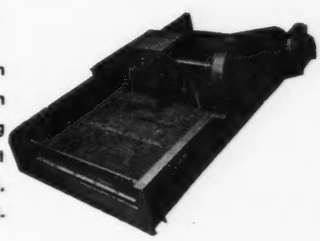

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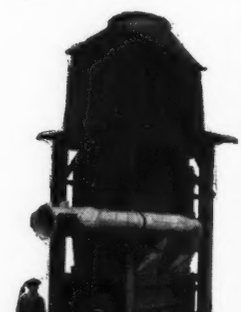

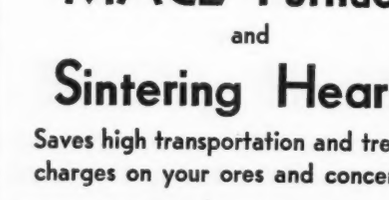

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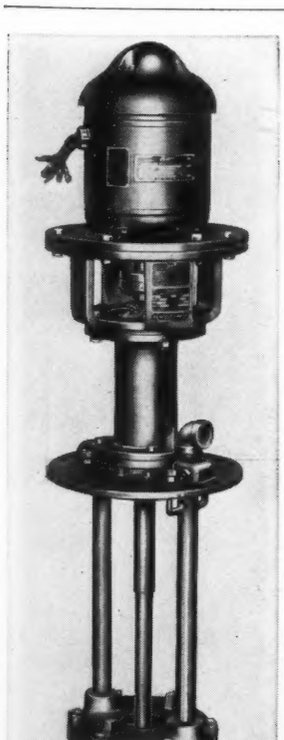

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New Guinea (*Continued*)

floated. All equipment for restoring the hydro-electric power plants has been delivered, and the upper and lower stations will be able to supply 8,000 hp. which will be sufficient for all requirements. Transmission will now be at 33,000 volts, instead of 11,000 volts as before. Production from May 31 to October 31 was 31,710 oz. of gold from the treatment of 2,756,000 cu. yd. of ground, an average of 5.5 gr. gold per cu. yd. Reserves of ground are calculated at 128 million cu. yd. of dredging ground, with, in addition, an area of 21 million cu. yd. to be sluiced.

PHILIPPINES

Mindanao Motherlode to develop new vein—Atok-Big Wedge company reports on 1947 and development plans

★ The annual report of Surigao Consolidated for 1947 reveals positive and probable ore reserves of 374,179 tons valued at $3,489,000, exclusive of considerable low-grade surface ore that is not profitable unless mined by large-scale mechanized operations. All mining is now being conducted underground. The Gemperle Shaft, now completely repaired, has a capacity of 400 tons per day. The mill is 90% rehabilitated, and the power plant and compressor are operating at original capacity. The total final cost of rehabilitation approximated $1,000,000. Wage costs have advanced from pre-war average of $1.34 ($0.67) per day to $2.49 ($1.25) in addition to a living allowance. The management anticipates production in 1948 to approximately 350 to 400 tons per day of 0.3 oz. gold per ton, with 89% recovery. It is proposed to sink the shafts to the 400 and 500-ft. levels and open these up for mining.

★ Gross revenue of the Benguet Consolidated Mining Co. for the first quarter of 1948 was $1,240,337. Gold production was valued at $630,447 and 64,199 tons of chrome ore sold from the Masinloc operation brought in $609,890. Production was at the rate of 1,200 tons per day in March and will be stepped up as more equipment arrives.

★ During 1947 the Atok-Big Wedge Mining Co. recovered $2,033,247 from milling 91,599 tons of ore with 94% extraction. Production started March 16. Operating profit was $1,317,187. The company sold its gold on the open market in Manila and realized about $43 per ounce on the average. Ore reserves are reported at 424,762 tons with a gross value of $6,644,700. Of this, 280,679 tons are classed as positive, with an average value of $18.15 per ton. Some reduction in average value is noted as a result of high-grading by the natives during the long

shut-down in the war years when it is estimated that the value of the high grade stolen amounted to $1,777,000. Plans for the future provide for accelerated development and exploration work as soon as shaft capacity can be increased to handle waste rock from the headings. A new shaft equipped with a 150-hp. Nordberg double drum hoist with a capacity of 1,000 tons per 24 hours has been installed. A new fine reduction crusher and screening plant will increase present mill capacity by 40-50 tons per day.

★ March production for Mindanao Motherlode Mining Co. was reported at $106,390 from 5,100 tons, averaging $20.60 per ton. A new vein has been found on the surface with high values, which will be developed from the 540 level of the main vein. No. 2 shaft is being sunk to the 850 level where crosscuts will be run to the Tabon Tabon and No. 50 veins. The new mill is in shape to handle its full capacity of 250 tons per day.

★ Baguio Gold Mining Co. has opened up approximately 4 miles of underground workings since rehabilitation work started 2½ years ago. Resurveying and remapping is going on. More than half of the workings considered to be of economic grade have been reopened. Frank E. Delahunty has been made general superintendent, and R. Willis Deane, mine superintendent.

SOUTH AFRICA

Gold production declined in 1947 as costs rose—Industrial Diamonds of S.A. reports progress

★ Gold production in South Africa declined from 13,877,275 oz. in 1941 to 10,700,609 oz. in 1947 according to F. A. Unger, retiring president of the Transvaal Chamber of Mines. Tonnage milled during the same period dropped from 67,225,450 to 53,712,300. Working costs have risen from 21s.2d. per ton in 1941 to 26s.7d. in 1947. Working profits dropped from £45,800,000 in 1941 to £21,400,000 last year. Revenue to the State from mining decreased from £27,300,000 to an estimated £6,400,000 during this period, and dividends fell from £18,800,000 to £11,300,000.

★ Free State (Selected) Gold Reefs announce that borehole No. 2, on the farm, Pilgrims Estate No. 772, has intersected Vaal Reef with incomplete core recovery in a deflection at a borehole depth of 3,762 ft., assaying 2.03 dwt. per ton over a corrected width of 7.4 inches, equivalent to 15-in.-dwts. Pilgrims Estate No. 772 is immediately south of the Vaal River, near Klerksdorp.

★ The erection of the reduction plant at No. 4 shaft Daggafontein Mines is proceeding, but considerable difficulty

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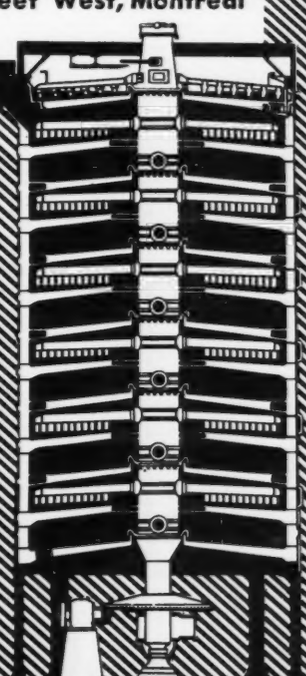

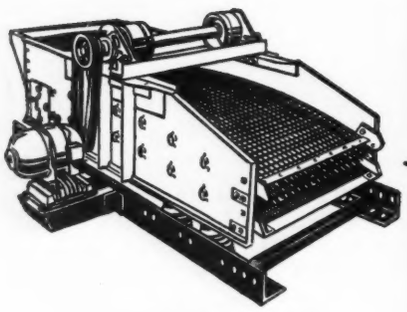

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South Africa *(Continued)*

is being experienced in obtaining steelwork for buildings; it is hoped, however, that this plant will be in operation during the latter part of this year.

★ For 1947 East Rand Proprietary Mines showed an improvement of £513,394 to £1,383,602 in working profit, compared with 1946. In view of the encouraging values disclosed it is proposed to sink a deep level shaft in the southeastern portion of the property from the surface of the 6,000-ft. horizon to be followed by a subvertical shaft to the 8,000-ft. horizon.

★ Working results of Witwatersrand Nigel for the quarter ended March 31, 1948, are as follows: Tons milled 28,500; yield, 7,896 oz.; net loss £4,459.

★ At Luipaardsvlei Estate, the new extension to the reduction plant was started on March 8, but unfortunately operations have been adversely affected since March 20 by a fire which broke out in the underground workings and was only extinguished on April 13.

★ Stoltzburg Asbestos announce that the new driers have been installed and are working satisfactorily. The plant can now, therefore, be considered an all-weather plant.

★ A progress report of Industrial Diamonds of South Africa states that the results of operations for the nine-month period of July, 1947, to March 31, 1948, were as follows: gravel mined, 5,157 cu. yd.; sifted gravel washed, 344 cu. yd.; diamonds recovered, 8,015 carats; recovery per 100 cu. yd. mined, 155 carats.

★ Prospecting in the Tete District shows no abatement and special interest is being taken in samarskite, a mineral containing small quantities of uranium. During February and March, 68 applications for mining rights were made for samarskite, six for coal, one for gold, three for asbestos and six for uranium.

★ Gold output in the Transvaal for the first quarter of this year was 2,898,571 oz., compared with 2,360,089 oz. in the first three months of 1947.

★ The mineral production of Northern Rhodesia for 1947 was valued at £24,555,173, comparing with £14,503,196 in 1946. Of this, copper (blister) accounted for £15,256,925 and electrolytic £6,584,330. Zinc was valued at £1,268,400; lead at £938,400; cobalt alloy £399,039 and vanadium pentoxide at £64,405.

★ The following are the production figures for March, 1948, issued by the Rhodesia Broken Hill Development Co., Ltd.: zinc, 1,910 long tons; lead, 1,155 long tons; fused vanadium (91.86% V_2O_5), 30 long tons.

★ After a four-day stoppage, work has resumed on the Roan Antelope mine. The hold-up was due to fear of flooding in consequence of heavy rains round Luanshya threatening to burst the storage dam above the mine.

★ A committee appointed by the Minister of Mines of Southern Rhodesia is holding an inquiry into the mechanization of small gold mines in the colony. The committee will include in its report designs of model installations and layouts for small mines. The main object of the investigation is to advise small workers where labor saving can be effected.

★ Unless Southern Rhodesian transportation is improved to permit the shipment of chrome ore to the coast, there is a serious danger that the country may disappear from the world chrome market. About 300,000 tons of chrome ore are said to be stockpiled. The ore cannot be moved to the coast because of a lack of rolling stock.

★ The Homestake Gold Mining Co., Ltd., operates the Tebekwe Mine, which showed a working profit of £27,651 for the year 1947, and which at June 30, 1947, had ore reserves of 199,700 tons valued at 3.5dwts.

★ Steel production has started at the Rhodesian Iron and Steel Commission's new works at Que Que, which will produce some 40,000 tons of pig iron a year and about half that tonnage in steel.

LETTERS

A Theory as to Rock Bursts

The Editor:

I read R.G.K. Morrison's very able article, "General Theory of Rock Bursts," in the December E&MJ. I also read a previous article of his, "Unsolved Problems of Rock Bursts," in the April number of last year.

Without questioning or discussing what others have said about rock bursts, I would like to call attention to a theory that, it seems to me, explains their nature very well. This theory calls for a relatively weak rock back of the mine walls, one weak enough that, under pressure it will push against the walls. It also calls for a comparatively narrow band of very hard wall rock, a rock that is practically imcompressible.

Pressure against the narrow band of wall rock will cause an arch to develop in it. Straightening out this arch (the arch acts as a lever or wedge) will cause a powerful end thrust, a thrust with a pressure some multiple of the pressure against the walls. Here is why the wall rock must be practically incompressible: Though the end thrust of the arch is enormous, its movement is slight. With so slight a movement, a wall rock that could be compressed could not build up a strained condition of sufficient strength to cause a burst.

When the arch straightens out and moves slightly past that point, it releases suddenly. Only an almost incompressible rock can release the strain suddenly.

WILLIAM CROCKER

Prescott, Arizona

I am interested in Mr. Crocker's remarks, but can only ask how he would account for rock bursts in a mine where the combination of rocks he visualizes was not apparent.

In the series of three articles prepared for the ENGINEERING & MINING JOURNAL I have endeavored to deal with rock bursts on the basis of conditions that could apply to any mine, and resolved to simplest terms have regarded them as the result of suddenly released elastic strain energy.

When one passes to the various characteristics of different rocks and the combination of other variables present in any single case, the situation becomes too complicated to discuss intelligently without first reaching some agreement on these factors.

The processes by which elastic strain energy can be accumulated in rocks and suddenly released are numerous, and I concede that Mr. Crocker's ideas may cover one of them.

R. G. K. MORRISON

Oorgaum, South India

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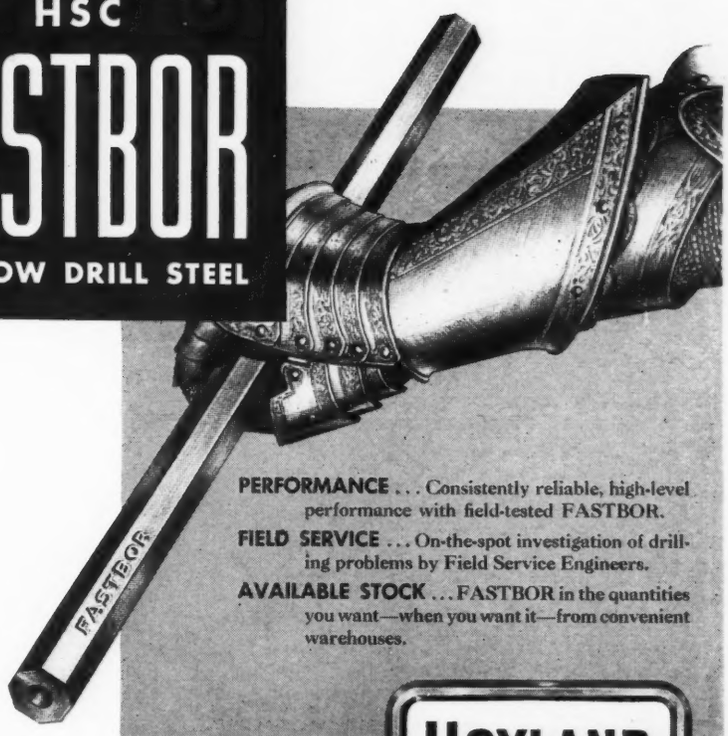

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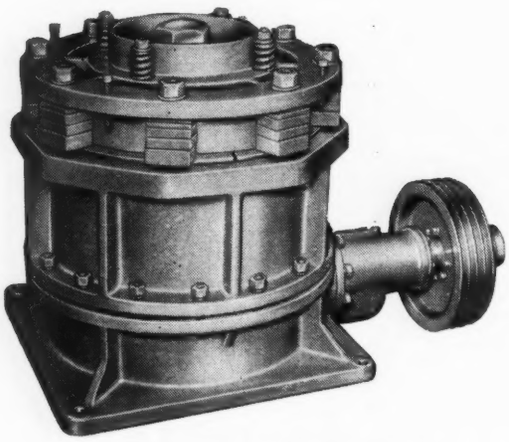

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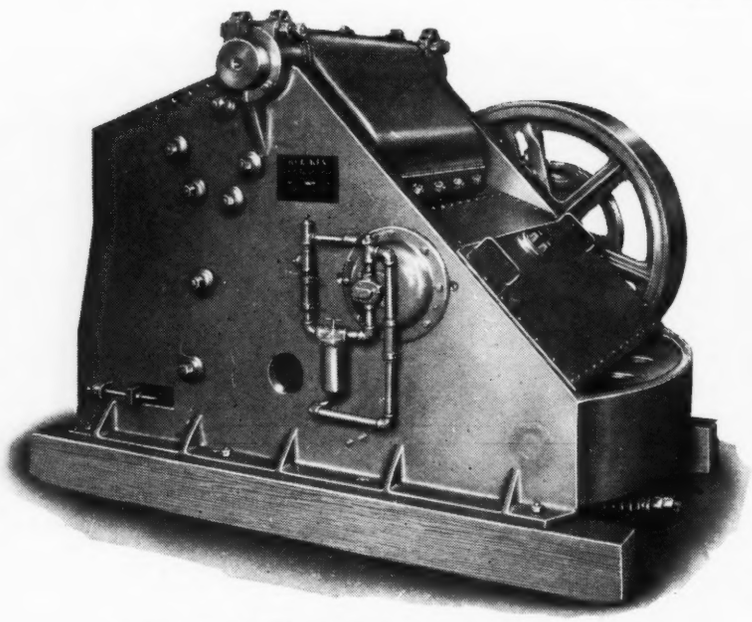

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